



Call for Papers

Workshop on Emerging information and communication technologies for smart railway Challenges and Opportunities for mmWave, THz, ISAC, 5G and 6G

IEEE VTC Spring 2025 – 17-20 June 2025, Oslo, Norway
Workshop Day: 17 June

The rail domain is entering the era of full automation thanks to wireless sensors and communication systems shifting control functions from the human driver to computers. High data rate, robustness, high reliability and ultra-low latency are required for the wireless communications in the context of autonomous train and safety critical applications. In the same time, the railway industry strives to improve customer experience, quality, reliability, safety and security of railway systems. Thus, we observe ever increasing information flows between all stakeholders. Another key driver is the optimization of maintenance, associated to strong requirements of sensing and data transmission.

Today, the 5G-based Future Railway Mobile Communication System (FRMCS) is under development. It will be IP based, multi-bearer and resilient to technology evolution and interferences. This system will be deployed in priority along high speed lines in the railway frequency bands (900 MHz and 1900 MHz) and secondary railway lines will not be equipped due to cost reasons. Nevertheless, to reduce our impact on climate, we urgently need to increase the use of the train particularly in rural areas with secondary lines. In this context, in order to maintain the required safety level, there is a huge need to guaranty full connectivity everywhere to passengers, devices and trains and to anticipate the presence of any obstacles on the infrastructure thanks to sensing functions and also inform the train about the level crossing status by monitoring the infrastructure even in unpopulated areas. 4G and 5G fail to resolve the connectivity challenges faced by secondary railway lines. The future 6G standard targets to offer this ubiquitous connectivity thanks to the concept of network federation and hybrid connectivity. Reconfigurable Intelligent Surface (RIS) can play a key role in improving both connectivity and safety in the context of railway lines. In addition, Integrated Sensing and Communications (ISAC) aims at unifying sensing and communication tasks with direct tradeoffs between them as well as mutual performance gains.

This workshop will enable Researchers and Engineers to present the latest results addressing the aforementioned key technologies and challenges in the context of emerging information and communication technologies for smart railway focusing on mmWave, THz, ISAC, 5G and 6G. The topic of the workshop in the context of railways are:

- Propagation, railway channel measurements and models for 5G/6G focusing on mmW, THz bands
- Antenna requirements & designs, antenna systems and integration for railways and trains for 6G
- RIS
- ISAC
- Development of ubiquitous, real time, robust and energy efficient wireless communication system based on 6G architecture able to be deployed in a context of poor Terrestrial Network (TN) cellular coverage and the reception of future Non-Terrestrial Networks (NTN).
- Optimized solutions for mobile edge computing management
- Seamless Mobility management solutions in 6G context
- Energy efficient flexibility and reconfigurability of the wireless communication network based on AI, cognitive radio (spectrum sensing) /network approach (multi RAN, SDN, NFV, slicing, Mobile Edge computing, etc.) considering different applications constraints and associated QoS (safety critical, video streams, etc.).

The learning objectives are to disseminate the latest results on the different listed topics with a focus on Railway domain (High speed trains, conventional trains, secondary lines, metros)

Prospective authors are invited to submit 5-page, original, and unpublished full papers. A full paper can be up to 7 pages in length, just note that papers longer than 5 pages will require the purchase of additional page charges at the time of registration and final paper submission.

Paper submission at:

For details on this workshop, please refer to:

Deadlines

Workshop paper submission due: 27 February 2025

Workshop paper acceptance notification: 10 March 2025

Final paper submission: 3 April 2025

Organizers

Dr. Marion Berbineau, Research Director, Université Gustave Eiffel

Prof. Ke Guan, Professor, Beijing Jiaotong University

Dr. Juan Moreno García-Loygorri, Associated Professor, Universidad Politécnica de Madrid

Technical program committee (to be confirmed)

Dao Tian, ZTE Corp. Ltd.

Pierre-Yves Petton, SNCF

Dr. Leo Mendiboure, Université Gustave Eiffel

Dr. Rafaele d'Errico, CEA

Dr. Nicolas Gresset, MERCE

Dr. Philipp Svoboda, TU Wien

Prof. Wei Wang, Chang'an University

Prof. Cesar Briso, Universidad Politécnica de Madrid

Dr. Paul Unterhuber, DLR

Prof. Qiumign Zhu, Nanjing University Of Aeronautics And Astronautics

Dr. Xose Rodriguez Pineiro, Tongji University

Program

09h00 - 09h30 **Key note 1: Understanding Mobile Millimeter-Wave and sub-THz Channels for Communication and Sensing, Dr. Xuesong Cai, Lund University, Associate Professor (Docent)**

09h30 - 10h00 "Performance evaluation in a railway environment for mmWave bands", J.C Sibel et al, MERCE

10h00 – 10h30 "measurements-based mmW channel modelling in railway environments, IMT-Atlantique

10h30-11h00 break

11h00 – 11h30 **Key Note 2: Networks of networks in 6G: a key enabler for mission-critical applications, DR L. Mendiboure, Université Gustave Eiffel**

11h30 – 12h00 "Multi-RIS-assisted Railway Communications in Tunnel", Aline Habib &al., IMT-Atlantique

12h00 – 12h30 "GNN-based Super-Resolution for Multipath Channel Generation in Railways", Meiwen Zhang, et al, Beijing Jiaotong University

12:30 – 14:00 Lunch

14h00 – 14h30 **Key note 3: Status of use cases in 6G standardization at ETSI, MERCE**

14h30 – 15h00 "mmwave In Railways: Use Cases And Results", Juan Moreno García-Loygorri and Cesar Briso, UPM.

15h00 – 15h30 "Refining Ray-Tracing Accuracy and Efficiency in the Context of FRMCS Urban Railway Channel Predictions". SIRADEL

15h30 – 16h00 break

16h00 – 16h30 paper 7

16h30 – 17h00 paper 8

17h00 – 17h30 paper 9

Organizer details

Marion Berbineau

PhD, Research Director

Université Gustave Eiffel, Cosys department, Léost laboratory

marion.berbineau@univ-eiffel.fr

Marion Berbineau received the Engineer degree from Polytech'Lille (France) and the Ph.D. degree from the Univ. of Lille, both in electrical engineering, respectively in 1986 and 1989. She is a full time Research Director at Université Gustave Eiffel (equivalent to Professor at University). She was director of a 20 people lab during 12 years and Deputy Director of the Components and SYStems Department (11 laboratories and 264 people) from 2011 to 2017. She is now in charge of the coordination of Railway research. She is active in research with national and European projects. She is expert in the fields of radio wave propagation in transport environments (tunnels), channel characterization and modelling, MIMO, wireless systems for telecommunications, Cognitive radio particularly for the rail domain. She is active as an expert for the GSM-R and FRMCS. She is author and co-author of several publications and patents. She is vice-chair of EURNEX (<https://www.eurnex.org/>) and ERRAC platform (<https://errac.org/>).

Ke Guan

PhD, Professor
Beijing Jiaotong University
kguan@bjtu.edu.cn

Ke Guan is a Professor at the State Key Laboratory of Advanced Rail Autonomous Operation and the School of Electronic and Information Engineering, Beijing Jiaotong University, and a Research Advisor at Jožef Stefan Institute, Slovenia. In 2016, he was awarded a Humboldt Research Fellowship. From February 2023 to July 2023, he was a Guest Professor at Technische Universitaet Wien, Austria. In 2024, he was elected as a Life Fellow of the Royal Society for Arts, Manufactures and Commerce (Life FRSA) and a Fellow of the Royal Asiatic Society of Great Britain and Ireland (FRAS). He has authored/coauthored two books and five book chapters, more than 200 journal and conference papers, and ten patents. His current research interests are digital twinning of electromagnetic environments in various complex scenarios based on ray-tracing and machine learning. His project TwinSWAN was the winner of 2024 IET Excellence and Innovation Awards. He is Beijing Jiaotong University's contact person for 3GPP and ETSI and a member of the IEEE VTS Propagation Committee, IEEE AP/S TC Propagation and Scattering, and the COST IC1004, CA15104, and CA20120 initiatives.

Juan Moreno García-Loygorri

PhD, Rolling Stock Engineer & Associated Professor
Universidad Politécnica de Madrid
Juan.moreno.garcia-loygorri@upm.es

Dr. Juan Moreno works as a rolling stock engineer within Madrid Metro, in the rolling stock department where is focused on research activities. He is also a part-time professor & researcher (within the Radio Communications Group) in the Universidad Politécnica de Madrid. His research interests are channel measurement & modelling, railway communications systems, condition-based maintenance systems for railways and software-defined radio. He has participated in many railway-related research projects both national and European and has co-authored more than 60 papers on railway communications. He has three international patents and his SPARC project was listed as a finalist of the TALGO innovation awards in 2021. He is an IEEE Senior Member and IEEE Communications Magazine Associated Technical Editor.