Dresden University of Technology

TUD Dresden University of Technology, as a University of Excellence, is one of the leading and most dynamic research institutions in the country. Founded in 1828, today it is a globally oriented, regionally anchored top university as it focuses on the grand challenges of the 21st century. It develops innovative solutions for the world's most pressing issues. TUD has established the Research Training Group "AirMetro - Technological & Operational Integration of Highly Automated Air Transport in Urban Areas" (RTG 2947), funded by the German Research Foundation (DFG). This interdisciplinary group, involving five faculties and the German Aerospace Centre (DLR), will conduct research on 11 research topics. The goal is to address the technical and social challenges of Innovative Air Mobility (IAM), considering ecological, economic, technological, and sociological factors. The RTG's structured PhD program aims to train young researchers in highly automated, networked mobility, featuring international collaboration with mentors from the USA, Asia, and Europe. TUD and the RTG embody a university culture that is characterized by cosmopolitanism, mutual appreciation, thriving innovation and active participation. For TUD diversity is an essential feature and a quality criterion of an excellent university. Accordingly, we welcome all applicants who would like to commit themselves, their achievements and productivity to the success of the whole institution.

The **Research Training Group RTG 2947 "AirMetro"**, funded by the DFG, offers a position, as

Research Associate / PhD Student (m/f/x)

(subject to personal qualification employees are remunerated according to salary group E 13 TV-L)

starting **May 1, 2026**. The position is limited until April 30, 2029. The period of employment is governed by the Fixed Term Research Contracts Act (Wissenschaftszeitvertragsgesetz - WissZeitVG). The position aims at obtaining further academic qualification (usually PhD).

Job ID:	**RTG2947-T2/2**
Title:	Surrogate metamaterial modelling for effective vehicle communication in IAM operations
Supervisor:	Prof. Michael Kaliske, Chair of Structural Analysis and co-supervised by at least one additional professor plus an international tutor of the RTG

Description of the PhD topic:
This PhD topic focuses on far-field communication effects of building-integrated electromagnetic meta-surfaces, such as façades or dedicated urban structures, with the aim of controlling and improving radio propagation for IAM operations. While Cohort 1 concentrates on high-fidelity finite-element modeling of the electromagnetic near field of meta-surfaces under coupled physical effects, this project builds on those results to model far-field behavior relevant for communication networks. The objective is to develop reduced-order surrogate models using physics-informed machine learning (e.g. PINNs, PIGNNs) that predict network-level quality metrics such as RSSI and SINR, given the geometry, placement, and orientation of base stations and meta-surfaces in an urban environment.

The surrogate models provide fast estimates of far-field radio coverage in urban environments that can be used during planning and operation. This makes it possible to assess communication quality along flight trajectories and to study how the placement and orientation of base stations and meta-surfaces affect radio performance, including their interaction with path planning under realistic constraints.

Objectives:

- develop reduced-order, physics-informed surrogate models for predicting far-field communication quality metrics (e.g. RSSI, SINR) in urban IAM scenarios
- enable real-time, on-board estimation of radio-coverage and communication performance during Vertical Take-Off and Landing Capable Aircraft (VCA) operation
- integrate coupled multi-physical FE simulation results (electromagnetic, thermal, mechanical) into surrogate model training
- demonstrate applicability of the surrogate models in joint optimization of communication infrastructure placement and flight path planning
- validate surrogate model performance using simulation-based benchmarks and on-board hardware tests. A trained model can be run on-board purchased hardware during test-flights to prove utility

Tasks:

- independent and cooperative qualification through scientific research within one of the PhD study projects on offer
- training in the technical tasks of the individual dissertation topics through study of the literature and in making the objectives more precise
- working on the individual PhD study project with experimental, numerical in collaboration with other RTG members (fellow students and supervising professors)
- implementation of the planned research program, evaluation and interpretation of the results and transferring them to a RTG internal ex-change platform, elaboration and presentation of the state-of-the-art in the respective research fields
- participation in lectures, workshops and summer schools according to the guidelines of the RTG curriculum
- supporting scientific graduation work (Bachelor/Master/Diploma) in the subject-specific research field
- regular reporting on research progress to the supervising professors
- publishing the results of the research work individually and in concert with others; cooperative maintenance of exchange platforms (database, information pages, etc.)
- summarizing the results of the individual PhD study project in a dissertation within the due time of three years
- Successful candidates will work together with an experienced PhD researcher at the Chair of Air Transport Technology and Logistics and together with other chairs being part of the RTG.

Requirements:

- good or very good university degree as M.Sc. or Dipl.-Ing. in civil engineering or mechanical engineering or comparable with deep knowledge in continuum mechanics, structural analysis, advanced mathematics, modelling and simulation
- We are looking for first-class graduates with expertise in the RTG-addressed PhD subjects, high interdisciplinary desire to learn and willingness to cooperate, very good verbal and written English communication skills as well as the absolute determination to submit the dissertation after 3 years of research.

We offer:

- **Pioneering Research Environment:** Shape the future of advanced air mobility through involvement in innovative drone-related projects that bridge technology, urban planning, material sciences, sensors and aviation. With the upcoming Smart Mobility Lab in Lusatia, Saxony, you will have access to state-of-the-art and extensive facilities for experiments. This includes a hall measuring 100x100x30 meters and outdoor space (available from 2027).
- **Cross-Disciplinary Collaboration:** Immerse yourself in a highly collaborative and interdisciplinary research environment, where you'll work alongside experts from fields such as engineering, data science, urban studies, and aerospace.
- **Skill Development:** Our extensive qualification concept goes beyond research, offering targeted training in drone technology, data analytics, regulatory aspects, project management, and leadership skills. This ensures you graduate not only as a specialist in your field but also as a well-rounded professional.
- **Global Networking:** Collaborate with our network of local and international partners, fostering connections that transcend geographical boundaries and enrich your academic and professional network. This includes a paid research stay abroad for three months.
- **Career Advancement:** Receive dedicated support for fellowship applications and tailored guidance for your career.
- **Quality of Life in Dresden:** Experience a high quality of life in Dresden, with its dynamic urban scene, relatively affordable living, rich cultural offerings, and vibrant nightlife.

Further questions regarding this call can be addressed to Prof. Dr.-Ing. Michael Kaliske (michael.kaliske@tu-dresden.de).

TUD strives to employ more women in academia and research. We therefore expressly encourage women to apply. The University is a certified family-friendly university. We welcome applications from candidates with disabilities. If

multiple candidates prove to be equally qualified, those with disabilities or with equivalent status pursuant to the German Social Code IX (SGB IX) will receive priority for employment.

Please submit your detailed application including a cover letter detailing your research interests stating the **job-ID "RTG 2947-T2/2"** along with your curriculum vitae, academic transcripts with marks, a letter of recommendation and your publications (if applicable) by **February 4, 2026** (stamped arrival date of the university central mail service or the time stamp on the email server of TUD applies), preferably via the TUD SecureMail Portal https://securemail.tu-dresden.de by sending it as a single pdf file to **airmetro@tu-dresden.de** or to:

TU Dresden, RTG 2947 "AirMetro", Prof. Hartmut Fricke, Helmholtzstr. 10, 01069 Dresden, Germany.

Please submit copies only, as your application will not be returned to you. Expenses incurred in attending interviews cannot be reimbursed.

AirMetro
Research Training Group
2947 at TU Dresden

TUD is a founding partner in the DRESDEN-concept alliance.

DRESDEN concept

Reference to data protection: Your data protection rights, the purpose for which your data will be processed, as well as further information about data protection is available to you on the website: https://tu-dresden.de/karriere/datenschutzhinweis.