

Helmholtz-Zentrum Dresden-Rossendorf e.V.



With cutting-edge research in the fields of ENERGY, HEALTH and MATTER, around 1,500 employees from more than 70 nations at Helmholtz-Zentrum Dresden-Rossendorf (HZDR) are committed to mastering the great challenges facing society today. The Institute of Radiation Physics conducts research for states of matter under extreme conditions and in very small dimensions. The Department of Laser Particle Acceleration is looking for a

PhD Student (f/m/d) Multimodal Reconstruction of Laser-Electron Accelerator Phase Space using Physics-Informed Deep Learning

City: Dresden; Starting date (earliest): At the earliest possible; Duration: 36 Months;
Remuneration: TVöD-Bund; Reference number: 2025/132; Closing date: 31/10/25

Working field

- Understand the physical process of Coherent (optical) Transition Radiation involved in measuring electron bunches from laser wakefield acceleration (LWFA)
- Implement physical forward functions in a differentiable form using pyTorch (e.g. COTR, CTR)
- Design and implement physics-informed deep neural network architectures which accelerate finding electron bunch shapes self-consistently for large measurement campaigns
- Implementation and evaluation of efficient training and reconstruction pipelines involving deep learning models
- Find required initial conditions for LWFA simulations which yield the reconstructed observed electron bunch shapes
- Close communication with experimental colleagues to understand the setup and communicate promising parameters to explore
- Publication of results in scientific journal and dissemination at conferences

Requirements

- Completed university studies (Master/Diploma) in the field of Physics (Computational-, Plasma Physics, Optics) or related field
- Mastery and use of the scientific method
- Experience in numerical modeling and computational workflows
- Knowledge about machine learning: statistics and deep learning
- Experience in data analysis, visualization and presentation
- Good programming skills in languages such as Python, Julia or C++
- Knowledge of modern deep learning frameworks (e.g. pyTorch)
- Knowledge of collaborative software development tools (e.g. Version control: Git)
- Experience working in Linux shell/cluster environment and on shared resources
- Independent, investigative working style
- Interest to work in an interdisciplinary environment

- Actively seeking input and openly sharing results and knowledge in a team

What we offer

- A vibrant research community in an open, diverse and international work environment
- Scientific excellence and extensive professional networking opportunities
- A structured PhD program with a comprehensive range of continuing education and networking opportunities - more information about the PhD program at the HZDR can be found [here](#)
- Salary and social benefits in accordance with the collective agreement for the public sector (TVöD-Bund) including 30 days of paid holiday leave, company pension scheme (VBL)
- We support a good work-life balance with the possibility of part-time employment, mobile working and flexible working hours
- Numerous company health management offerings
- Employee discounts with well-known providers via the platform Corporate Benefits
- An employer subsidy for the "Deutschland-Ticket Jobticket"

Application

We look forward to receiving your application documents (including cover letter, CV, diplomas/transcripts, etc.), which you can submit via our online-application-system: <https://www.hzdr.de/db/Cms?pNid=490&pLang=en&pOid=75809>

More information at <https://stellenticket.de/198734/TUBS/>
Offer visible until 31/10/25

