



2023 Helmholtz – OCPC – Programme for the involvement of postdocs in bilateral collaboration projects

PART A

Title of the project:

Beam dynamics studies for high brightness electron beams and their applications

Helmholtz Centre, division:

DESY, M-PITZ

Project leader:

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DESY Group:

PITZ at DESY in Zeuthen

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Description of the project (max. 1 page):

DESY is one of the world's leading research centres for photon science, particle and astroparticle physics as well as accelerator physics. More than 2400 employees work at our two locations Hamburg and Zeuthen in science, technology and administration. The Photo Injector Test facility at DESY in Zeuthen (PITZ) develops high brightness electron sources for Free-Electron Lasers (FELs) like FLASH and European XFEL and does R&D on high brightness beam applications.

The successful candidate will work on the beam dynamics and diagnostics of high brightness electron beams, including simulations and experimental studies of beam emittance and longitudinal phase space with advanced photocathode laser pulse shaping techniques; development of novel diagnostic methods, like accurate measurements of electron beam slice energy spread in low/moderate energy photo injectors. The candidate can also participate in work on the worldwide first THz SASE/seeded FEL at PITZ, where a high gain SASE FEL at the center wavelength of 100 μm was demonstrated last year. Further optimization of the THz pulse energy/stability using conventional or AI based algorithms and development of THz diagnostics will be followed, as well as the design of an ideal accelerator-based THz source for future pump-probe experiments at the European XFEL. Another focus can be the optimization of the space charge dominated beam for studying the most advanced treatment modality against cancer, the so-called FLASH radiation



therapy (FLASH-RT). Besides preparing and analysing ongoing experimental campaign, the design and realization of a dedicated new beamline for FLASH-RT can be part of the activity.

During any of the projects mentioned above, the candidate will participate in the PITZ accelerator operation, which will give a better insight and deeper understanding of the photoinjector physics and diagnostics of the high brightness electron beams.

Description of existing or sought Chinese collaboration partner institute (max. half page):

Sought partner:

All Chinese institutes that are interested in the above-mentioned project.

Required qualification of the postdoc:

- PhD in accelerator physics or relevant
- Experience with space charge dominated beam dynamics simulations, experiment experience with electron accelerators is of advantage.
- Good command of English, knowledge of German is of advantage.
- Excellent teamwork spirit in an international working environment for one of the world-leading teams on high brightness photo injectors.