



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

PART A

Title of the project:

Simulation on THz sources and propagation for FLASH2020+

Helmholtz Centre, division:

DESY-FS-FL

Project leader:

Elke Plönjes, Rui Pan

Contact Information of Project Supervisor: (Email, telephone)

rui.pan@desy.de, +49 (0)40 8998-4526

Web-address:

https://photon-science.desy.de/facilities/flash/index_eng.html

DESY Group:

Photon Science/FLASH/Beamline (FS-FL-B)

DESY-OCPC Programme Coordinator (Email, telephone and telefax)

Frank Lehner; frank.lehner@desy.de; +49 40 8998 3612

Description of the project (max. 1 page):

DESY operates the free electron laser FLASH whose GW level, femtosecond pulses offer unique opportunities for multidisciplinary research in the extreme ultraviolet (XUV) and soft X-ray range. FLASH at DESY has a unique FEL scheme providing soft X-ray beam and intense THz simultaneously. The two beams can be used to study matter by pump-probe techniques.

A project to upgrade FLASH, FLASH2020+ [1], is ongoing at DESY. The project is to make the next step forward with the facility where especially the external seeding and shorter pulses will enable new and unique scientific opportunities. Within FLASH2020+, the extra THz sources generated by Optical Transition Radiation (OTR) and Optical Diffraction Radiation (ODR) will be built.

To efficiently exploit the high THz intensity at FLASH and efficiently deliver the photon beam to the users' end-station, a simulation on the new THz sources is required. The applicant is expected to simulate the OTR/ODR and investigate its interference with the THz undulator radiation and edge radiation. Based on the simulation, the design of OTR/ODR and the photon beamline will be optimised.

The successful candidate has the opportunity to be involved in the whole THz beamline upgrading project in FLASH2020+, including THz photon beamline design, endstation construction, and THz



doubler development [2] which lasing of separated two electron bunches for THz and XUV generation respectively for pump-probe experiments. The successful candidate will also have the opportunity to participate and support users' experiments and in-house research.

[1] 'FLASH2020+ Conceptual Design Report' (CDR), (2020).

[2] E. Zapolnova, et al., 'THz pulse doubler at FLASH: double pulses for pump-probe experiments at X-ray FELs', J Synchrotron Radiat., 1; 25(Pt 1): 39–43, (2018).

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

The postdoc position could be embedded into the collaboration of DESY's free electron laser facility FLASH with the Shanghai soft X-ray free-electron laser facility (SXFEL), which is under commissioning in Shanghai to be expanded into a user facility, and the hard X-ray FEL facility SHINE, currently under design and construction. The postdoc will benefit from the strengthening of the relation of DESY with the Shanghai Institute for Applied Physics (SINAP) and ShanghaiTec University through the "CAS-Helmholtz International Laboratory for FEL Science and Technology"(CHILFEL). On the Shanghai side the collaboration will be led by Prof. Zhi Liu, Vice Dean of the School of Physical Science and Technology, ShanghaiTec University. ShanghaiTech University and SINAP are two leading research institutions strongly engaged in FEL science and technology in China.

The postdoc position could also help to start an interaction with the Institute of Advanced Science Facilities, Shenzhen (IASF). IASF is a multi-disciplinary research center based on the integrated particle facilities in Shenzhen, Guangdong Province, China. At the primary phase, two active infrastructure projects recently have been being funded and under design and construction, a diffraction limited synchrotron light source and a Shenzhen superconducting soft-X-ray free electron laser (S³FEL).

Required qualification of the postdoc:

- PhD in physics or a related field
- Experience in photon science by using THz wave, FEL or ultrafast laser
- Good skills in Python or Matlab.
- Team player with good communication skills
- Good command of English



PART B

Documents to be provided by the post-doc, necessary for an application to OCPC via a postdoc-station in China, which is affiliated to a research institution like a university:

- Detailed description of the interest in joining the project (motivation letter)
- Curriculum vitae, copies of degrees
- List of publications
- 2 letters of recommendation
- Proof of command of English language

PART C

Additional requirements to be fulfilled by the post-doc:

- Max. age of 35 years
- PhD degree not older than 5 years
- Very good command of the English language
- Strong ability to work independently and in a team