

## 2019 Helmholtz – OCPC – Program for the involvement of postdocs in bilateral collaboration projects

### PART A

**Title of the project:** Kinetic modelling of high-intensity laser particle accelerators

**Helmholtz Centre and institute:**

Forschungszentrum Jülich GmbH, Jülich Supercomputing Centre (JSC) and  
Peter-Grünberg Institute, Electronic Properties (PGI-6)

**Project leaders:** Prof. Dr. Paul Gibbon (JSC), Prof. Dr. Markus Büscher (PGI-6)

**Web-addresses:**

[http://www.fz-juelich.de/ias/jsc/DE/Home/home\\_node.html](http://www.fz-juelich.de/ias/jsc/DE/Home/home_node.html)

<https://jusparc.fz-juelich.de>

**Description of the project:**

The recently inaugurated Jülich Short Pulse Radiation and Particle Centre (JuSPARC) has the ambition to provide high quality short-wavelength radiation and high-flux energetic particle beams for a broad spectrum of applications in material science, biology, medicine, plasma and nuclear physics. Modelling such novel sources is a major challenge, and requires demanding multi-dimensional numerical simulations with sophisticated kinetic particle codes running on state-of-the-art supercomputing hardware. At FZJ the strong cooperation established between PGI-6 (Electronic Properties) which hosts the laser facility, and JSC (Jülich Supercomputing Centre) provides an ideal environment in which to devise and test innovative radiation and particle sources both theoretically and experimentally.

Currently at FZJ we are actively developing a number of such sources including: betatron radiation produced via laser-driven electron acceleration in the nonlinear cavity regime; XUV radiation via high-harmonic generation both from gaseous sources and ionized solid targets; and also laser-accelerated polarized proton beams – a process where Jülich has unique targetry and diagnostic expertise and will shortly lead an experimental campaign to observe this phenomenon with the recently commissioned 10PW laser at the SIOM petawatt laser lab in Shanghai – currently one of the most powerful laser systems in its class worldwide.

We are seeking a strong candidate with experience in kinetic laser-plasma modelling to join our team to work on refining established acceleration schemes through novel targetry and assist with supporting experimental campaigns at the laser labs in Jülich and Shanghai. Although knowledge of and willingness to work on one of the above topics of current interest will be advantageous, the successful candidate will also have ample opportunity to develop his/her own ideas during the stay in Jülich. The position will be hosted within the Plasma Simulation Lab of the Jülich Supercomputing Centre, comprising a group of numerical plasma modelling specialists with considerable high-performance computing experience, and will also be closely linked to the experimental group of Prof. Büscher at PGI-6, where weekly joint meetings take place.

**Description of existing or sought Chinese collaboration partner institute:**

The funding through this programme will be used to strengthen established collaborations between FZJ and two separate institutes with world-class pedigree in Shanghai: namely, the Key Laboratory for Laser Plasmas at the Shanghai Jiao Tong University (Prof. Shengming Chen), with whom the PI Gibbon has had several recent joint publications and participated in the 7<sup>th</sup> Asian Summer School and Symposium on Laser Plasma Acceleration and Radiation in 2016<sup>1</sup>; and the Shanghai Institute of Optics and Fine Mechanics (SIOM) Petawatt laser laboratory (Prof. Liangliang Ji). The successful candidate will have an opportunity to interact with both theoreticians and experimentalists in Jülich, and will play an important bridging role in supporting joint experiments by the FZJ and SIOM teams.

We also welcome collaboration with any Chinese institution that deals with the same subjects and shares our scientific interests.

**Required qualification of the post-doc:**

- PhD in laser-plasma interaction physics
- Experience with numerical plasma modelling; kinetic (particle-in-cell) simulation methods
- Sound knowledge of computational physics, high-performance computing, theoretical plasma physics
- Good communication skills; ability to interact with multi-disciplinary experimental and theoretical/computational teams.

**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

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<sup>1</sup> <http://asss-llp.sjtu.edu.cn>