Elettra Sincrotrone Trieste

Accelerator Physicist at FERMI

Deadline: 5 September 2025
Ref: CA/25/23

Background

Elettra Sincrotrone Trieste is an international multidisciplinary research center offering international users access to synchrotron and free-electron laser radiation for the characterization and processing of matter. The extremely high quality of the light sources and beamlines has set new performance records and has been producing results of great scientific and technological interest. See http://www.elettra.eu for more information.

Unique among the FEL sources, FERMI exploits the external seeding mechanism (http://www.elettra.eu/FERMI/) to provide fully coherent ultrashort (15-100 femtosecond) pulses of unprecedented stability and reproducibility with a peak brightness ten billion times higher than that made available by third-generation light sources. FERMI is opening unique opportunities for exploring the structure and transient states of condensed matter, soft matter and low-density matter using a variety of diffraction, scattering and spectroscopy techniques.

Beamline/Activity/Project description

Both theoretical and experimental work is necessary to exploit the present capabilities offered by the FERMI FEL-1 and FEL-2 laser lines, and to develop new strategies for the development of the machine complex as well as new FEL schemes. In the past years, an upgrade strategy leading to substantial modifications to the FERMI FELs has been defined, with the aim of maximizing the impact of this unique seeded source on the experimental applications by:

1. extending the FEL-2 spectral range down to the oxygen K-edge on the fundamental harmonic and to the 1 keV photon energy at the higher order harmonics;

2. reducing the pulse duration to sub-15 fs range;

3. extending the possibilities of generating multiple pulses while preserving the synchronization between them.

Details on the upgrade strategy can be found on the FERMI 2.0 Conceptual Design Report available here. In particular, the recent completion of the upgrade of FEL-1 to an Echo Enabled Harmonic Generation scheme (EEHG) has doubled the photon energy range of operation of that FEL line. One important aspect to consider, however, is the build-up of the microbunching instability, which grows along the linac and the spreader line distributing electrons to the FEL lines, and which is amplified by the first large dispersive section of FEL-1. Studies are ongoing in order to find a configuration of the accelerator optics capable of mitigating the energy spread growth due to microbunching instability. The results of these studies are, at the same time, the benchmark for the upgrade strategy of the FEL-2 line, aiming at extending its operational range up to the oxygen K-edge and possibly beyond.

Job description

The successful candidate will join the Accelerators Group as a member of the FERMI Machine Physics team and, in particular, of the Task Force in charge of studying the electron beam optics and dynamics in the FERMI linear accelerator and FEL lines. Among her/his tasks, there will be the study of the interplay between FEL emission and microbunching instability in the presence of magnetic bunch length compression for high peak currents and large energy-dispersion in the undulator chain.

She/he will collaborate with the physics staff in the development of new concepts to enhance the capability and performance of the FERMI FELs. She/he will be involved in the operation of the facility, is expected to contribute to its further developments, and will be encouraged to develop and strengthen links with accelerator physics specialists from other international facilities.

Qualifications

Ph.D. in Accelerator Physics or Engineering, or three years ofexperience in the field of particle accelerator physics and/or

free-electron lasers physics are required.

The following additional qualifications will be considered as important assets:

1. Experience in tuning and running an accelerator from the control room;

2. Good knowledge of accelerator design, accelerator optics, and beam dynamics codes;

3. Good knowledge of microbunching instability theory and computational models to quantify it;

4. Good knowledge of beam instrumentation;

5. Programming skills and knowledge of codes (Python, Matlab, C++; PIC codes such as Parmela, Astra, GPT, Elegant, Genesis, Ginger, etc.)

The successful candidate should possess strong interpersonal skills to pursue collaborative research programs in a team-oriented environment and become part of existing research collaborations.

Good time management skills and ability to prioritize are expected, together with the ability to interact with project partners and work as part of a multidisciplinary team.

Good oral and written communication skills in English are essential. A working knowledge of Italian would be desirable.

General information

The deadline for the submission of the application is September 5, 2025.

The appointment will be a fixed-term employment contract of an initial duration of 24 months, extendable by agreement of both parties, in accordance with the legal provisions in force, currently up to a maximum of 36 months. The salary will be commensurate with previous experience and qualifications of the candidate.

Applications should include full curriculum vitae, and contact information (including electronic mail) of at least two references.

The interviews could be performed through video conferencing.

The ranking of suitable candidates resulting from this selection process may be used within the following 24 months.

Employees or former employees of Elettra Sincrotrone Trieste S.C.p.A. or temporaryand staff leasing employees or former employees with working experience atthe companywill be excluded from the present selection procedure. Employees or former employees of any Italian Public Entity who have exercised authority over Elettra Sincrotrone Trieste S.C.p.A. or have negotiated with Elettra - Sincrotrone Trieste S.C.p.A. within the last three years, will also be excluded from the present selection procedure, in accordance with the provisions of article 21 of the Italian legislative decree no. 39/2013 and in conjunction with article 53 (subsection16ter) of Italian legislative decree no. 165/2001.

We thank all applicants in advance.
For more information, please contact Simone Di Mitri (email: simone.dimitri@elettra.eu).

To apply for this position please visit the following link:
https://www.elettra.trieste.it/it/about/careers/working-withus.html?id=4261