



Elettra Sincrotrone Trieste

Scientist for CONCERT project

Deadline: 11 June 2026

Ref: DB/26/21

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. In order to allow the laboratory to remain competitive in the next 20 years, an entirely new synchrotron radiation source - Elettra 2.0 - belonging to the new generation of storage rings (DLSR or Diffraction Limited Storage Ring) is being installed and will join the already operating free-electron source FERMI in the second half of 2026. The new source will exhibit a major increase in the brilliance and coherence fraction of the photon beams. The Elettra 2.0 optics is based on our enhanced symmetric six bend achromat structure (S6BA-E) with a 12-fold symmetry and an emittance of 200 pm-rad at 2.4 GeV. The new structure creates also straight sections in the arcs permitting the installation of additional insertion devices, thus increasing the number of beamlines. Existing beamlines are being upgraded and new beamlines constructed to take full advantage of the characteristics of Elettra 2.0. See <http://www.elettra.eu> for more information.

Beamline/Activity/Project description

CONCERT (Capturing and cONtrolling conical intErsections in Real Time) is a project funded by an ERC Synergy Grant; it brings together researchers from Politecnico di Milano, CNR, University of Bologna, the University of California Irvine, and Elettra-Sincrotrone Trieste. Conical intersections (CIs) are regions in the potential energy surface of molecules where different electronic energy levels cross, leading to the breakdown of the Born-Oppenheimer approximation and promoting non-adiabatic transitions between electronic states. CIs preside over essential ultrafast processes in photobiology, photochemistry, and materials science as they can be viewed as "doorways" through which a photoexcited vibrational wave packet (WP) is efficiently funnelled to a lower-energy electronic state. Despite a thorough theoretical understanding, CIs have been experimentally elusive so far, due to the extreme speed of the processes leading to, and occurring at, the CIs and to the associated large variation in the energetic landscape of the molecule, calling for extreme spectral and temporal resolutions. Leveraging recent experimental advances in the generation of ultrashort soft X-ray pulses, and conceptual advances in nonlinear optical spectroscopy, CONCERT aims to: i) directly visualise the very moment when the molecular WP passes through the CI, and the associated quantum mechanical electronic coherences; ii) use this knowledge to control, using tailored light pulses, the WP dynamics in the vicinity of a CI and, ultimately, the outcome and the yield of a photochemical reaction, by operating exactly where the fate of the process is decided. CONCERT will have both fundamental and applied impact. On the one hand, it will enable the understanding of the molecular mechanisms driving the passage of a WP through a CI, advancing our knowledge of nature and providing design guidelines for artificial molecular systems that mimic the natural ones. On the other hand, it will offer the ability to control the rates and branching ratios of photochemical processes by manipulating the excited state WP in the critical region that determines its ultimate path, fulfilling the long-held dream of using light as a photonic catalyst to control the outcome of chemical reactions.

Job description

The CONCERT project has just been launched and one of the pillars of its experimental programme is being built around the unique capabilities of the FERMI free-electron laser. The highly interdisciplinary project's focus on the real-time observation and control of ultrafast dynamics at conical intersections requires a close collaboration between beamline scientists, machine physicists, instrumentation engineers, technical staff and early-career researchers, all of whom are members of the local team at Elettra-Sincrotrone Trieste. Members come from physics, chemistry, materials science and engineering and work jointly to design, construct, and operate a movable self-contained liquid-jet end-station on any of the LDM, TIMEX, and DiProl beamlines. The team will also lead the definition of experimental protocols, data-analysis pipelines, and training pathways for PhD students and researchers.

FERMI's track record underpins this endeavour: it is the world's first seeded free-electron laser delivering stable, precise, coherent extreme-ultraviolet and soft X-ray pulses with sub-10-fs duration, and has produced pioneering work in time-resolved X-ray absorption spectroscopy, coherent diffraction imaging, and ultrafast chemical dynamics. Within the broader, multidisciplinary research ecosystem at FERMI, the collaborative development of the machine is a critical

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enabler for the experiments envisioned by CONCERT.

Within the wider Elettra scientific environment the group maintains close ties to the Elettra ζ 2.0 upgrade programme, collaborates with other beamlines and support laboratories, and routinely engages with a diverse international user community. The culture of the team emphasizes rigorous scientific independence, cross-disciplinary training, and the translation of experimental insights into actionable knowledge.

The main duties will be:

- Contribute, as part of an interdisciplinary and international team, to the development, upgrade, and maintenance of a liquid-jet apparatus for time-resolved experiments in the liquid phase, exploiting the core capabilities of the LDM, TIMEX, and DiProl beamlines at FERMI.
- Collaborate with FERMI beamline scientists and technical staff to consolidate and further develop end-station capabilities, supporting a diverse international user community.
- Supervise PhD students and postdoctoral researchers within the CONCERT project, and coordinate the activities of technical personnel.
- Actively contribute to collaborative and cross-disciplinary research projects within the CONCERT team and the broader FERMI scientific environment.

Qualifications

- Ph.D. in Physics, Engineering, Chemistry, or a closely related discipline is required.
- At least 3 years of postdoctoral research experience at large-scale facilities (synchrotron radiation sources, free-electron lasers, or high-power laser facilities), with demonstrated scientific independence.
- Proven ability to design, develop, and manage cutting-edge experiments within large, collaborative teams.
- Demonstrated expertise in the design, implementation, and operation of aerodynamic lens systems and/or liquid jet setups.
- Familiarity with ultrafast dynamical processes initiated by optical lasers and/or FEL radiation.
- Research experience in at least two of the following areas:
 - (a) Nonlinear processes in atoms, molecules, or clusters
 - (b) Time-resolved X-ray absorption spectroscopy
 - (c) Coherent diffraction imaging or holography
 - (d) X-ray small-angle scattering (SAXS)

Any of the following will be considered as a valuable additional asset:

- Experience with optical systems, including lasers, detectors, fiber optics, and associated electronics.
- Experience with low-temperature environments and/or high-magnetic-field set-ups.

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- Experience with vacuum systems and mechanical design using 3D CAD software (e.g., SolidWorks, CATIA, Solid Edge).
- Demonstrated programming and data analysis skills (e.g., Python, MATLAB), including instrument control and interfacing.

Good time management skills and ability to prioritize are expected, together with the ability to interact with the facility staff and international users at all levels, and to work as part of a multi-disciplinary team.

Good oral and written communication skills in English are essential.

General information

The appointment envisioned is a fixed-term employment contract with an initial duration of 12 months, extendable by agreement of both parties, in accordance with the legal provisions in force, currently up to a maximum of 36 months. The employment contract will be governed by the National Collective Labour Agreement (CCNL) for the Metalworking and Plant Installation Industry and by the Company Agreement pursuant to Article 8 of Decree Law 138/2011, dated 28 March 2024.

Applications must include completed, dated, and signed curriculum vitae, a motivation letter, including the contact details of at least one person who has agreed to provide references.

The salary will be commensurate with previous experience and qualifications of the selected candidate.

The interviews may be held via 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., as well as current or former personnel provided by temporary work agencies will 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 (subsection 16ter) of Italian legislative decree no. 165/2001.

The deadline for the submission of the application is June 11, 2026.

We thank all applicants in advance.

For more information, please contact Claudio Masciovecchio (email: claudio.masciovecchio@elettra.eu) or Carlo Callegari (email: carlo.callegari@elettra.eu) or Flavio Capotondi (email: flavio.capotondi@elettra.eu).

To apply for this position please visit the following link:

<https://www.elettra.trieste.it/it/about/careers/working-withus.html?id=4298>

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