

L'Orme des Merisiers, Saint-Aubin

BP 48 - 91192 Gif-sur-Yvette Cedex, FRANCE

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| **Post-doctoral Position – (m/f)** | **Accelerator Division** |

Position: Available since April 2021 and shall be open until filled.

### SOLEIL is the French national synchrotron facility, located on the Saclay Plateau near Paris. It is a multi-disciplinary instrument and a research laboratory, whose mission is to run research programs using synchrotron radiation, to develop state-of-the-art instrumentation on the beamlines, and to make those available to the scientific community. SOLEIL, a unique tool for both academic research and industrial applications across a wide range of disciplines including physics, biology, chemistry etc., is used by over 5 000 researchers coming from France and abroad. It is based on a state-of-the-art synchrotron source, both in terms of brilliance and stability. The facility is a “public” company employing about 500 people, founded by the CNRS and the CEA, and partner of the Paris-Saclay University. The storage ring that generates synchrotron radiation stores a 2.75 GeV electron beam, has the circumference of 354 m, and runs continuously 24 hours a day, 7 days a week, with uninterrupted periods up to 10 weeks. Currently studies for a major upgrade project are being pursued.

### Post-doctoral Position - (m/f)

### Mission

### As described above, SOLEIL is routinely delivering photons as a state-of-the-art 3rd generation light source (LS) in the world with its demonstrated performance. It provides a low beam emittance of 4 nm·rad horizontally and 40 pm·rad vertically with excellent stability. The storage ring consists of an extended DB (Double Bend) lattice, which is fully optimized in terms of high availability of straight sections for insertion devices, beam sizes and divergences at source points, and of beam lifetime. Top-up injection as well as a number of feedback systems is running at all times. Besides, it constantly runs in 5 modes of operation, differing in beam fillings, stored beam currents and optics, to fulfill the demands of a wide range of experiments carried out in the beamlines.

### On the other hand, there is today an explosive wave in the LS community worldwide of constructing a new generation of LS rings called Diffraction Limited Storage Rings (DLSR), thanks to a marked progress in the technology over the last decade especially in magnets and vacuum. Designing a lattice with bending magnets split in many pieces and introducing high gradient quadrupoles in between them in a special configuration called Multi-Bend Achromat (MBA) allows lowering the horizontal emittance by more than an order of magnitude, which in turn increases the brilliance typically by two orders of magnitude. To be able to continue serving as a top class light source in future, SOLEIL has officially launched R&D studies for its upgrade since beginning of 2019 and a CDR (Conceptual Design Report) was compiled at the end of 2020.

### It has been known, however, that construction of a DLSR imposes a series of critical accelerator physics and technological challenges to overcome. A lattice achieving the desired ultra-low horizontal emittance generally suffers resultantly from reduced dynamic acceptance due to enhanced nonlinearity, and also to extremely high sensitivity to all sorts of imperfections. On top of which, in the case of upgrading an already existing machine such as SOLEIL, another fundamental difficulty must be faced, namely that an upgraded DSLR must match the radiation source points of the existing beamlines. With all above taken into account, the SOLEIL upgrade CDR team has come up with a lattice solution providing a horizontal natural emittance of nearly 80 pm.rad and meeting to a large extent the geometric constraints of the existing beamlines.

### The Upgrade Team continues its effort in the aim of making a TDR (Technical Design Report) available at the end of the year 2022, with the objective of accomplishing the assessment of technical feasibility of the CDR lattice from all possible points of view, of both the accelerator physics and the mechanical engineering.

### The successful candidate is expected to work as a member of the accelerator physics group at SOLEIL and shall be fully involved in what are classified as the single particle dynamical aspects of the studies necessary for the TDR phase of the upgrade project. Specifically, the tasks shall deeply be linked to the lattice designs of the main and the booster rings, their tuning range and nonlinear optimizations, impact of insertion device fields and errors (both systematic and random), as well as beam lifetime, IBS and collimation of scattered particles. He (or she) shall use intensively numerical codes such as AT (Accelerator Tool box), TRACY, MADX, OPA, elegant and BMAD known to be useful for the accelerator designs, develop additional routines in case of needs and also be in charge of maintaining some of these codes against their frequent upgrades. In addition, he (or she) shall likely interact with colleagues of various engineering groups to study the realization aspects of the developed lattices.

### He (or she) shall be regularly given opportunities to participate in conferences and workshops and present his (or her) works, as well as making publications of the outcomes in appropriate journals.

### Qualifications & Experience

The candidate is expected to possess a PhD degree in physics or equivalent competence. We are looking for a motivated candidate with a very strong university background in physics (classical physics and electrodynamics), mathematics (linear algebra, numeric methods, statistics), as well as in computer science (programming in MATLAB, python, C, C++, FORTRAN etc., as well as knowledge of numerical codes for accelerators). Experience with synchrotron radiation, accelerator physics, high energy physics or relevant engineering fields would be a particularly important asset. The working language is English. Ability to speak French shall be an added value.

### General conditions

The offer concerns a Post-doctoral contract for 12 months-period with the possibility of one year renewal.

The working place shall be at Synchrotron SOLEIL, which is located in the Paris suburbs (Saint-Aubin in the Prefecture of Essonne).

Applications should include a motivation letter and Curriculum Vitae with the addresses of three references. Applications should be preferably registered directly on the SOLEIL website (via the button “*ENVOYER UNE CANDIDATURE*”):

<https://www.synchrotron-soleil.fr/en/job-offers/post-doctoral-position-studies-and-development-storage-ring-lattice-soleil-upgrade>

**Contact :** Human Resources

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