

**PhD Thesis Student (m/f) Subject: Modelling X-ray beam propagation along synchrotron radiation beamlines**

**Purpose**

The European Synchrotron Radiation Facility (ESRF) in Grenoble (France) is seeking candidates for a new PhD student in the area of modelling X-ray optics for large facilities. The ESRF is a multinational research institute that operates a powerful synchrotron X-ray source with some 30 beamlines (instruments) covering a wide range of scientific research in fields such as biology and medicine, chemistry, earth and environmental sciences, materials and surface science, and physics. To learn more about the ESRF go to: <http://www.esrf.eu>.

The scope of the project is to study the radiation emitted by ultrarelativistic electrons and develop methods and computer tools that simulate the characteristics of the X-ray beams (intensity, coherence, polarization) along the optical elements of a synchrotron beamline (crystals, lenses, multilayers and mirrors). It is proposed to treat the problem by a hybrid approach combining methods from physical optics (wave-front propagation) and geometrical optics (Monte Carlo ray-tracing).

**Context**

The ESRF Upgrade programme include advances in optics, source characteristics, and beam quality that require a considerable enhancement of the current modelling capabilities, both in software infrastructure and physics approach. The PhD activities concerns the use of programs, the development of new models and their integration and combination into existing codes for: i) computing the characteristics of the radiation emitted by relativistic electrons, including the accelerator parameters (emittance, beta functions and dispersions), ii) simulating the effect of new optical elements (e.g. transfocators) on the optical performances of a beamline and studying crystals used as monochromators as well as focusing devices and phase-retarders, and iii) analysing the preservation and transport of the spatial coherence using hybrid algorithms that combine wave optics and ray tracing.

The thesis work includes simulations for new ESRF beamlines including optimization during commissioning, using existing computer codes (e.g. SHADOW, SRW). Experimental work including tests and measurements of optical elements and data analysis are also envisaged.

**Qualifications and Experience:**

We are looking for motivated candidates with a very strong university background in physics (optics, classical electrodynamics, radiation-matter interactions), mathematics (linear algebra, numeric methods, statistics), and computer science (compiled languages such as Fortran or C, interpreted languages like Python or Mathematica and producing advanced graphic environments). Experience with synchrotron radiation, plasma physics, accelerator physics, high energy physics or relevant engineering fields would be an asset. The candidate should possess good communication skills and work effectively with a heterogeneous and multi-cultural group

The candidate should hold a degree in physics or electrical and computer engineer allowing enrollment for a PhD, such as an MSc, Master 2 de Recherche, Laurea or equivalent.

**Technical Questions:**

Questions regarding the position may be directed to Dr. Manuel Sanchez del Rio ([srio@esrf.eu](mailto:srio@esrf.eu)).

**Our offer:**

Contract of two years renewable (subject to satisfactory progress) for one year. Monthly gross salary around 2300 Euros.

For further information on employment terms and conditions, please refer to <http://www.esrf.fr/Jobs/Conditions>. The ESRF is an equal opportunity employer and encourages applications from disabled persons.

Deadline for returning application forms: 15th March 2013. We encourage students finishing their studies in 2013 to apply for this position. Estimated starting date: September 2013.

To apply (on-line) for this position (Ref. CFR379) visit [http://esrf.profilsearch.com/recrute/fo\\_annonce\\_voir.php?id=179](http://esrf.profilsearch.com/recrute/fo_annonce_voir.php?id=179)