



PhD position in Accelerator Physics at LAL

Topic: Optics Design and Performance Evaluation of the Future Circular Collider hadron beam collimation system

Description: A hadron collider with a centre-of-mass collision energy of about 100 TeV and a proton-proton luminosity of $5 \cdot 10^{34} \text{ cm}^{-2} \text{ s}^{-1}$, permitting operation with both proton and ion beams would be the next big step forward in particle physics at the high-energy frontier. In this context, a conceptual design study has been launched by a collaboration of institutes and universities worldwide, among which the Laboratoire de l'Accélérateur Linéaire (LAL) at Orsay. A new accelerator of such scale critically depends on the feasibility of several key technologies pushed beyond the current state of the art. Innovative designs for accelerator magnets to achieve high-quality fields up to 16 T and for a cryogenic beam vacuum system to cope with unprecedented synchrotron radiation power are required. The effects of colliding two 50 TeV beams must be mastered to meet the physics research requirements. Advanced energy efficiency, reliability and cost effectiveness are key factors to build and operate such an accelerator.

Efficient beam collimation is one of the critical components requiring special attention. The FCC-hh collimation system performs several tasks. It must keep the energy deposition by the beam in the cold superconducting magnets below an acceptable level to avoid quenches of the magnets, and to protect the experiments from machine-induced backgrounds, all while keeping impedances within acceptable limits.

The PhD to be recruited at LAL will be expected to work closely with partner groups including IRFU at Saclay, JAI in the UK, and CERN, in order to design and simulate the efficiency and performance of the proposed collimators. The PhD at LAL will need to liaise efficiently with these international groups working on the optical lattice and machine detector interface. The LAL Accelerator Department will in the context of the conceptual design study focus on the design and evaluation of the FCC hadron beam collimation system, with a specific focus on new optical layouts and collimation system designs. This includes studies of background sources from beam-beam interactions and the collimators themselves, the effect of the layout on the machine impedance, beam energy deposition studies and power loads, as well as other safety and sustainability issues.

Practical details: The position is co-funded for three years by the LAL and CERN FCC project. The possible starting date is from September 2017. The fellow will be based at LAL (Orsay, France) and enrolled in one of the UPS doctoral programs, with some travel within laboratories taking part in the FCC collaboration, especially CERN.

Qualifications: Applicants need to have a Master 2 level in physics or engineering. Experience in accelerator physics, as well as in computing, would be an advantage. Knowledge of French, although not essential, would be useful.

Application: A letter of motivation outlining relevant experience and goals, a CV and letter(s) of recommendation should be sent before July 20, 2017. Candidates from all parts of the community are welcome to apply.

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More information about FCC can be found at: <https://fcc.web.cern.ch/>