

Two Postdoctoral researcher positions in LHCb at Saclay

Short summary

The Quark Gluon Plasma Laboratory (LQGP) of CEA Paris-Saclay is opening two postdoc positions for two junior physicists in the field of experimental physics with a focus on low-mass Drell-Yan Run 3 data analysis with LHCb. One position is for three years, one position is for two years initially. The LQGP is part of the Nuclear Physics Division (DPhN) of the Institute of Research into the Fundamental Laws of the Universe (Irfu) located at CEA Paris-Saclay (France). The LQGP is composed of eight permanent staff physicists working in the field of heavy-ion physics with two experienced staff researcher involved in LHCb analysis in 2024.

The environment

Irfu is a highly dynamic scientific environment including research divisions on astrophysics, nuclear and particle physics as well as strong technical and engineering divisions in instrumentation, cryogenics and accelerator technologies. The LQGP has a strong commitment in the experimental investigation of the Quark-Gluon Plasma through the study of heavy-ion collisions and has active interfaces with the Hadron Structure Laboratory (LSN) working in experiment, phenomenology and theory on the exploration of different type of parton distributions. In particular, LQGP physicists have been instrumental to the study of quarkonium production, currently focusing on the experimental program of ALICE at the LHC and starting activities in LHCb at the LHC.

The context

For the long term future, the LQGP is also contributing to the development of the heavy-ion physics case and the required LHCb Upgrade 2, with a particular interest in tracking with silicon pixel detectors. The group is involved in the silicon pixel upgrade in terms of hardware and reconstruction developments. The post-doctoral position is part of the broader research program, which aims at the understanding of the early stages of hadron-hadron collisions : i.) the investigation of the initial state density and configuration/momentum-space geometry via inclusive and exclusive measurements ; ii.) the emergence of hydrodynamics with dileptons in theory and experiment ; iii.) the investigation of the production of charm quarks, their interaction and hadronisation.

The project

The successful candidates are expected to initiate the analysis of low-mass Drell-Yan production in the dimuon channel with LHCb in proton-proton collisions, based on new background rejection techniques to suppress semileptonic decays of heavy-flavour hadrons. In addition to the two postdocs and Michael Winn, a PhD student will start in Fall 2024 in the group to work on the subject. The project will profit from the LQGP group member Benjamin Audurier, an expert on LHCb reconstruction and analysis software. In case of issues in Run 3 data taking/non-availability, large statistics samples from Run 2 can be as well analysed for this measurement. The project includes the development of suitable simulations and trigger lines, the development of new background suppression and signal extraction techniques and potentially the optimisation of particle identification. All the

technical items are of interest beyond the specific measurement. The measurement is a central missing piece in the investigation of the initial state at the LHC and a prerequisite for the study of dilepton production in heavy-ion collisions both in collider and fixed-target mode at the LHC. The study of the feasibility in heavy-ion collisions will be integral part of the project. In addition, the application of the developed methods to already recorded pPb data are as well a central missing measurement for hadron structure and quarkonium physics and can be envisaged in case of sufficiently fast progress. This project is at the cross roads between high-energy physics (precision electroweak measurements at higher masses), hadron structure (physics of parton distributions) and quark-gluon plasma (extension of the measurement to heavy-ion collisions). It will be carried out in cooperation with the LHCb group of IJCLab in Orsay, in particular Patrick Robbe. In case of an extension towards fixed-target collisions, the already existing collaboration with the fixed-target experts at LLR, Palaiseau, will be exploited. Depending on personal preference and available time, she/he will have the opportunity to also contribute to other activities fitting in the described panorama.

The application

Applicants should have completed, at the time of start, a PhD in experimental nuclear or high-energy physics, have expertise in data analysis using high performance computing techniques and have a maximum of a six years experience after the PhD. A prior experience with the development of instrumentation for large-scale nuclear or particle physics experiments would be beneficial. Applications should include :

- A 2-page cover letter with a description of previous work experience.
- An academic CV including a list of the candidate's most relevant publications, analysis notes or talks given in international conferences or workshops.

Contact and timelines

Applications should be sent before February 1st 2024 to michael.winn@cea.fr ✉. The candidates are expected to start their position between the 1st of July 2024 and the 1st of October 2024. Two recommendation letters should be sent directly by the letter authors to the same address. Questions related to the postdoc opening may be sent to the same email address.

