

Post-doctoral position opening at Clermont

CP-violation Physics analyses in LHCb with charmless b -flavoured hadron decays. Flavour Physics prospective and electromagnetic calorimeter R&D for FCC-ee.

Program

The French Institute for nuclear and particle physics (IN2P3-CNRS) is funding one post-doc position to work for a period of two years primarily on physics analyses in the LHCb group at Laboratoire de Physique de Clermont LPC. A secondary project concerns novel developments for high energy physics calorimeter detector in the context of the Future Circular Colliders Feasibility Study. The profile of this position will allow the successful applicant to develop simultaneously detector and physics skills.

The LHCb-oriented part of the project aims first at measurements of three-body charmless decay modes of neutral b -flavoured mesons containing one neutral pion in the final state. The LHCb collaboration, and in particular the Clermont group, has explored in some details two classes of companion modes: the three-body charmless decay modes including a K_s in the final state on one hand, and the radiative decays $B_d \rightarrow \pi\pi\gamma$ and $B_s \rightarrow K\pi\gamma$ on the other hand. The former class features a similar physics as the modes of interest in this project while the latter will be one of the important background sources to control in order to select these modes. The search for imprints of Beyond Standard Model contributions to CP -violating observables in $X_b \rightarrow hh'\pi^0$ decays, where h is either a ρ , K or a π , is the ultimate target of the first part of this project. The observation for the first time of the decays $B_s \rightarrow KK\pi^0$ or $\Lambda_b \rightarrow pK\pi^0$ will pave the way towards this goal. The improvements in the reconstruction of the π^0 candidates featuring two interleaved electromagnetic photon clusters is one of the significant experimental challenges to take.

The LHCb collaboration promotes an ambitious upgrade project of the LHCb experiment to make the best use of the High-Luminosity-LHC phase. In order to cope with the large number of interactions per bunch crossing, all sub-detectors must be upgraded and the Clermont group contributes decidedly to the electromagnetic calorimeter upgrade through electronics R&D related to the time measurement of the calorimeter clusters. This instrumental work will be complemented by physics studies at simulation level to assess the required performance. The decay channels with a neutral pion in the final state described above can constitute natural benchmarks to run. More novel ideas can (and should) also be explored, such as the possibility to reconstruct the decay $B^0 \rightarrow \pi^0\pi^0$, considering one neutral pion to experience the Dalitz decay $\pi^0 \rightarrow e^+e^-\gamma$. The obvious interest of such a reconstruction is the knowledge of the decay vertex of the B meson, enabling a time-dependent analysis of this decay. The successful applicant will be welcome in these studies.

The last element in the scope of this post-doctoral position concerns R&D and physics prospective studies for the Future Circular Collider Feasibility Study hosted by CERN. This study has been engaged following the last update of the European Strategy for particle physics and is meant to strengthen and complement the

Conceptual Design Reports published in 2018. The Clermont group is involved in the project since the beginning of the Design Study in 2014. The successful applicant is expected to contribute part-time to establish detector requirements related to the Flavour Physics case. The very same decay channels that are studied in the context of the LHCb experiment shall be advantageously considered as well for FCC-ee. These physics prospective studies are complemented by an R&D program about a novel idea of electromagnetic calorimeter, studied in collaboration with IJCLab. The successful candidate will be welcome to contribute as well in this instrumental area.

Position and main responsibilities

This post-doctoral contract at the LPC will enable the candidate to work on both high-impact physics analyses and detector instrumental developments. The successful candidate is expected to rapidly take on scientific responsibilities in either area. The period covered by this contract will also see the continuation of Run III data collection and the successful candidate will be able to contribute to the operation of the LHCb detector.

Required qualifications

The successful applicant must have completed a PhD in Particle Physics. Acquaintance with flavour physics is preferred though not mandatory. A former experience in detector developments is a plus but is not mandatory neither.

Programming: skills in C++, ROOT and python, acquaintance with the LHCb software is preferred though not mandatory.

Language: fluency in spoken and written English.

Good communication skills and ability to work in a team.

Information

Type of contract:	<i>temporary contract</i>
Appointment period:	<i>the appointment is 24 months</i>
Scheduled Hire date:	<i>15th of October 2023</i>
Working Quota:	<i>full time</i>
Remuneration:	<i>between 2400 and 2500 euros monthly net</i>
Workplace:	<i>LPC, Clermont-Ferrand (63118), France</i>
Attachment:	<i>LHCb collaboration</i>
Trips:	<i>regular travels to CERN</i>
Required level of education:	<i>PhD in Particle Physics</i>

How to apply

The applicants should submit a detailed Curriculum Vitae (including a description of their research with a list of publications highlighting their personal contributions) and a cover letter explaining the interest in the position. Application should be made through CNRS recruitment website:

<https://emploi.cnrs.fr/Offres/CDD/UMR6533-STEMON-001/Default.aspx>

For any additional information, please contact Olivier Deschamps and / or Stéphane Monteil at the following addresses: olivier.deschamps@clermont.in2p3.fr , monteil@in2p3.fr

At least two letters of recommendation shall be sent directly by the referees to above address.

The deadline for the submission of the application is the 5th of October, 2023. We reserve the right not to make an appointment and continue searching after the closing date. Only shortlisted candidates will be contacted.



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