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Istituto Nazionale di Fisica Nucleare

PostDoc fellowship - POKER ERC project

within the POKER group at INFN-Genova

Job Description and Candidate's Profile

INFN announces opportunity for a two-years PostDoc fellowship in the context of the “POsitron resonant annihilation into darK matter (POKER)” project. The fellowship is funded by the European Research Council (ERC) Starting Grant “POKER” under the European Union’s Horizon 2020 research and innovation programme.

POKER aims to establish and demonstrate a new approach to search for light dark matter, based on a missing energy measurement with a positron-beam, active thick-target setup. Light dark matter is the new compelling hypothesis that identifies dark matter with new sub-GeV “Hidden Sector” states, neutral under Standard Model interactions and interfacing with our world through a new force. Accelerator-based searches at the intensity frontier are uniquely suited to explore it. However, current and planned efforts are either limited by the low sensitivity or the high backgrounds. This calls for a major breakthrough in the field.

The new technique proposed by POKER, based on light dark matter production through positron annihilation on atomic electrons, is characterized by a larger signal yield compared to previously explored reactions, and by a unique signal signature - a peak in the missing energy distribution - resulting from the underlying reaction dynamics. The goal of the project is to demonstrate the new technique by preparing and running a pilot experiment using the 100 GeV e^+ beam provided by the CERN H4 beamline with an optimized detector.

POKER will work in close contact with the NA64 collaboration at CERN, currently carrying a dark sector search experimental program at the same facility using an electron-beam, missing energy setup. In particular, POKER is expected to make use of the existing NA64 beam tagging and hadron calorimeter system, while developing a new optimized active target with improved energy resolution.

The PostDoc Researcher will be involved in the development of Monte Carlo simulations of the positron-based experimental setup, used to characterize the signal properties and the background sources in the experiment. He will also follow the design of the pilot experiment at the CERN H4 beamline, with the goal of developing a full feasibility study of the positron measurement, including the search strategy, the beam requirements and the setup configuration, the background estimate and the sensitivity reach, and finally the running time required to get it. This study will be discussed with the NA64 collaboration and then presented to the CERN SPSC committee for approval.

The researcher will also take part to the ongoing NA64 program, participating to the experiment preparation and execution in the 2021-2022 period.

Candidates are required to hold a PhD in experimental particle physics. Specific experience with the GEANT4 simulation tool and/or with the use of statistical methods for data analysis is also expected.

Interested candidates are encouraged to contact Dr. Andrea Celentano, PI of the POKER project (andrea.celentano@ge.infn.it). The position is expected to be effective starting from Spring 2021, following the official INFN recruitment procedures.



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Position details:

- Full-time position for two years, with the possibility of further one year extension depending on funding and performance.
- Net annual salary: 19.367,04€
- The position will be based in Genova - although the possibility to be based for a significant period at CERN can be also discussed.
 - In both cases, a significant participation to NA64 activities at CERN is expected (experiment preparation, data-taking shifts, ..)
- Benefits include:
 - Social security benefits (information is available on request).
 - 5000€ incentive if the selected candidate got his master from an institution other than Genova University **and** was not resident in Genova the three years previous to the start of this activity.
 - Lunch tickets.

The POKER project has received funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement No. 947715).