

Postdoctoral position: Probing core-collapse supernovae with neutrinos At the AstroParticles and Cosmology laboratory

Position location: APC, 10, rue A. Domon & Léonie Duquet – 75013 Paris – France

Contract: Researcher CDD (Contrat à Durée Déterminée)

Initial contract duration: 12 months (renewable)

Starting date: as soon as possible

Salary: depending on experience

APC laboratory

APC is a leading laboratory in France in the field of Astroparticles and Cosmology. The laboratory participates in a wide array of major experiments in this field, such as CTA, Planck, VIRGO, VRO and EUCLID. Its neutrino group, in particular, is involved in the ANTARES, KM3NeT, and DUNE neutrino experiments, as well as in the neutrino search program of the DarkSide dark matter detector. The group has been spearheading the search for core-collapse supernovae at KM3NeT as well as proposing new analyses to locate supernovae by combining multiple experiments.

Job description

The LEAK team at APC is looking for a Postdoctoral Research Associate to work on the detection and characterization of Core-Collapse Supernovae (CCSNe) at KM3NeT, DUNE, and DarkSide. CCSNe are an essential component of the dynamics of the Universe, leading to the formation of neutron stars and stellar black holes, as well as paving the way to the birth of new stars. The observation of SN1987A as well as increasingly precise CCSN simulations indicated that neutrinos produced in the core of the collapsing star play a crucial role in the CCSN evolution. In addition to providing a complete recording of the core-collapse process, observing neutrinos from a CCSN would allow us to send alerts to optical telescopes as well as an analysis window for gravitational wave detection.

Current and upcoming neutrino telescopes are however only sensitive to CCSNe occurring in our galaxy and its immediate vicinity, which take place only a few times per century. The need to seize what could be a once-in-a-lifetime opportunity has sparked a widespread effort to establish networks of neutrino experiments, design combined triggers, and propose novel analysis strategies. The goal of the Low Energy Astrophysics at KM3NeT (LEAK) project is to combine the expertise of experimentalists working on KM3NeT, DUNE, and DarkSide at APC with the one of theorists working on CCSN simulations at the AIM (CEA Saclay) and LUTH (Paris Observatory) laboratories.

The successful candidate will join the KM3NeT group and will play a leading role in the LEAK project, working on two fronts. First, the candidate is expected to design innovative methods to identify and characterize CCSNe. A major challenge here is to expand the energy range of the experiment, since KM3NeT is primarily geared towards high-energy astrophysical neutrino studies. Second, the candidate will investigate the impact of CCSN and particle physics properties on neutrino observations, using simulations developed by the AIM and LUTH groups. In particular, the candidate will investigate synergy opportunities between KM3NeT, DUNE, and DarkSide.

The candidate is expected to play a major role in the KM3NeT collaboration and to be heavily involved in the activities of the astrophysics working group. In particular, they will have the opportunity to present their work at collaboration meetings three times a year, and will be able to attend international conferences. In parallel, the candidate is expected to interact regularly with the AIM and LUTH teams, as well as with the DarkSide and DUNE groups at APC, thus being exposed to a wide range of topics both in theory and experiment.

The LEAK project is funded by the UnivEarthS Labex on a yearly basis. Hence, the appointment is currently for one year and could be renewed depending on funding availability and upon evaluation by the Scientific Committee of UnivEarthS. The salary will be dependent on experience, in line with University pay scales.

Applicants are expected to provide a Curriculum Vitae, a publication list, a cover letter and at least two letters of recommendation. Please direct applications to Dr Sonia El Hedri (elhedri@apc.in2p3.fr), coordinator of the LEAK project. Priority will be given to applications received by Feb. 1st, 2022 but they will continue to be accepted until the position is filled.

For questions please contact:

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