Utrecht University

Unlock the potential of a world-wide unique prototype of a new detector technology to revolutionize future measurements in particle physics

PhD position in Digital Calorimetry

Our group has designed and built the only digital electromagnetic calorimeter, EPICAL-2, and has performed measurements with test beams. The prototype consists of tungsten absorbers and silicon sensors, with in total ≈25 million pixels of 30x30μm^2. The energy resolution of this new technology is on par with the current state of the art, but its position resolution and two-shower separation should be orders of magnitude better. Work in this project will enable the use of this potential.

Your job

The analysis of the data of this new detector prototype advances into uncharted territory in the physics of particle detection. While a conventional calorimeter provides a small number of signals (of the order of 5-10 real numbers) per measured high-energy particle, a digital calorimeter such as the EPICAL-2 yields a high-precision 3-dimensional spatial map of tens of thousands of pixel hits. The much higher information content will need completely new approaches for the efficient reconstruction of measurements. You will be a key person in understanding the working principle of the new technology, obtaining world-wide unique results on detector physics and developing the new algorithms. Your work will also include using a detailed Monte-Carlo simulation of the detector.

You will continuously work on the analysis together with a relatively small international group of researchers. Depending on the outcome of the analysis, you may set up another measurement at a test beam (e.g., at the CERN laboratory) with the prototype, which we have at hand. In this case, you will make yourselves familiar with modern FPGA technology. Furthermore, your work will contribute to the development process of such calorimeters in the wider context, via the CERN ALICE FoCal collaboration and the international Detector R&D collaboration on calorimeters (DRD6).

You will contribute to scientific publications on this project and will have the opportunity to present your results at international workshops and conferences. The scientific work in this project will be the topic of your PhD thesis at Utrecht University. The PhD will be done in the context of the Graduate School for Natural Sciences at Utrecht University and of the Dutch National Research School in Particle Physics. Besides your research work, you will have duties as teaching assistant in university courses in the physics department for a small fraction of your time.

Your qualities

We are looking for you, if you have a Master's degree in physics (or equivalent) and good knowledge of the English language and bring several or all of the following capabilities:

- basic knowledge of experimental particle physics;
- programming skills in C++ (experience with the CERN ROOT framework is a valuable asset);
- good communication skills and a collaborative attitude;

- genuine scientific curiosity.

Our offer

- a position for four years;
- a working week of 40 hours and a gross monthly salary between €2,770 and €3,539 in the case of full-time employment (salary scale P under the Collective Labour Agreement for Dutch Universities (CAO NU);
- 8% holiday pay and 8.3% year-end bonus;
- a pension scheme, partially paid parental leave and flexible terms of employment based on the CAO NU.

In addition to the terms of employment laid down in the CAO NU, Utrecht University has a number of schemes and facilities of its own for employees. This includes schemes facilitating professional development, leave schemes and schemes for sports and cultural activities, as well as discounts on software and other IT products. We also offer access to additional employee benefits through our Terms of Employment Options Model. In this way, we encourage our employees to continue to invest in their growth. For more information, please visit Working at Utrecht University.

About us

A better future for everyone. This ambition motivates our scientists in executing their leading research and inspiring teaching. At Utrecht University, the various disciplines collaborate intensively towards major strategic themes. Our focus is on Dynamics of Youth, Institutions for Open Societies, Life Sciences and Pathways to Sustainability. Sharing science, shaping tomorrow.

At the Faculty of Science there are six departments to make a fundamental connection with: Biology, Chemistry, Information and Computing Sciences, Mathematics, Pharmaceutical Sciences and Physics. Each of these is made up of distinct institutes that work together to focus on answering some of humanity's most pressing challenges. More fundamental still are the individual research groups – the building blocks of our ambitious scientific projects.

You will be part of the Institute for Gravitational and Subatomic Physics (GRASP) in the Physics Department of Utrecht University, where research is performed on two main topics:

1. experimental studies of high-energy collisions of protons and nuclei;
2. measurement and analysis of gravitational waves.

You will be member of the first research group, which has a focus on the ALICE experiment at the CERN LHC accelerator. The group works closely together with researchers at the Nikhef national institute for particle physics. We have strong contributions to data analysis on various topics related to the search for and study of the Quark-Gluon Plasma (QGP) and to detector development with the main focus on a tracking system with silicon sensors. A small subgroup that you will join has pioneered the technology of digital calorimeters and has built a world-wide unique prototype.

The EPICAL-2 team is a small international group of researchers, mostly juniors and a few seniors (acting as supervisors). The group has an open, collaborative atmosphere. The necessary analysis code is openly shared and developed together.

More information

For more information, please contact Professor T. Peitzmann at t.peitzmann@uu.nl.

Do you have a question about the application procedure? Please send an email to science.recruitment@uu.nl.

Candidates for this vacancy will be recruited by Utrecht University.

Apply now

As Utrecht University, we want to be a home for everyone. We value staff with diverse backgrounds, perspectives and identities, including cultural, religious or ethnic background, gender, sexual orientation, disability or age. We strive to create a safe and inclusive environment in which everyone can flourish and contribute.

If you are enthusiastic about this position, just apply via the 'apply now' button! Please enclose:

- your letter of motivation;
- your curriculum vitae;
- the names, telephone numbers, and email addresses of at least two referees.

If this specific opportunity isn't for you, but you know someone else who may be interested, please forward this vacancy to them.