THE PHYSICS COLLOQUIUM

Thursday 19 November 2026, 4:00 p.m.
Nijenborgh 4, Lecture Hall **5111.0080**

Precision at the Energy Frontier:
Overcoming the Instrumentation Challenge

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The search for physics beyond the Standard Model remains one of the central challenges in particle physics - what to look for and how to test it experimentally. Questions surrounding the nature of dark matter, neutrino masses and possible new particles motivate an extensive experimental programme at the worlds' currently most energetic collider, Large Hadron Collider (LHC). To access rare processes that could reveal new physics, the LHC is moving towards its High-Luminosity phase (HL-LHC), scheduled to begin operation in 2030. The resulting increase in collision rates will create increasingly challenging experimental conditions, with up to millions of particles produced within a single bunch crossing. Separating and identifying these particles will be essential to reconstruct collision events accurately and fully exploit the physics potential of the HL-LHC.

In this colloquium, I will discuss the instrumentation challenges involved in maximizing the physics potential of the HL-LHC, focusing on fast timing technologies that complement spatial measurements with temporal information to mitigate pileup and improve particle reconstruction. While significant progress has been made in sensor-level timing performance, integrating fast timing into a large-scale, fully functional 4D tracking detector remains a major challenge. Beyond sensor performance, system-level constraints, particularly power distribution and data acquisition, become critical when scaling up to a complete detector.

Looking towards future collider experiments, these challenges motivate a different approach to detector architecture, where minimizing material, power consumption and system complexity becomes essential. I will introduce the concept of a copper-less, light-in/light-out detector as a potential direction towards compact, lightweight and highly integrated 4D tracking systems.

Bio:

Mengqing is a tenured Assistant Professor at Radboud University in Nijmegen, the Netherlands, and is affiliated with the Dutch National Institute for Subatomic Physics (Nikhef) through a partnership between Radboud University and the Dutch Research Council (NWO). She has been involved in research at CERN since 2012 and is currently a member of the ATLAS experiment. She is also active in two detector R&D projects coordinated by the European Committee for Future Accelerators (ECFA), focusing on detector technologies for future collider experiments.

Mengqing completed her Bachelor's and Master's studies in subatomic physics at Lanzhou University before moving to Europe to pursue her career in experimental particle physics. She obtained her PhD from Université Grenoble Alpes in France, graduating with honours (mention bien), before undertaking postdoctoral research at CERN and DESY. She subsequently joined Radboud University as an Assistant Professor, where her research focuses on developing fast-timing detector technologies and searching for physics beyond the Standard Model at the LHC.

Join us for coffee starting 3:30 p.m. Refreshments will be served after the lecture.
For more information contact the host: Julia Even (j.even@rug.nl)
Website: https://www.rug.nl/research/fse/colloquia/physics-colloquia