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## Allpix Squared: Eight Years of Advancing Microscopic Monte Carlo Simulations for Semiconductor Detectors

*Friday 9 May 2025 11:00 (1 hour)*

Accurate simulations of signal formation in semiconductor detectors with high statistical precision are crucial across all phases of detector development, from initial design through to final qualification. Allpix Squared is a powerful, open-source simulation framework tailored for semiconductor detectors, enabling detailed end-to-end simulations that span from the initial interaction of ionizing radiation with the sensor to the output of digitized detector data.

Originally developed for silicon pixel detectors in high-energy physics, Allpix Squared has evolved into a versatile tool capable of simulating a wide range of detector types, semiconductor materials, and geometries. It supports applications in diverse fields, including space-based experiments, photon science, and medical imaging. A key strength of the framework lies in its modular architecture, which allows users to implement various algorithms for different stages of the simulation pipeline, interface with external tools like Geant4, TCAD, or SPICE simulators, and customize simulations by selecting the most appropriate modules.

Since its initial release eight years ago, Allpix Squared has undergone continuous development, expanding its capabilities and applications. This colloquium will provide an overview of the framework, highlight notable developments and applications across various domains, and present an outlook on future advancements.

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**Session Classification:** Nikhef colloquium