

Eleventh International Workshop on Semiconductor Pixel Detectors for Particles and Imaging



ID de Contribution: 120

Type: **Invited**

Realistic Monte Carlo simulation of silicon particle detectors for timing and tracking with Garfield++

mercredi 20 novembre 2024 10:30 (40 minutes)

Simulation-guided design represents a fundamental contribution towards the development of modern semiconductor devices aiming to reach high-performance particle detection, identification and tracking, and constitutes a strategic element of the new detector R&D roadmap.

At the same time, the complexity of microelectronic structures and the related detection systems is drastically increasing, also thanks to the progressive scaling down of the design rules with the process technology.

Owing to the capability to embed a detailed description of the ionisation mechanism into a device-level framework, as well as capture the stochastic nature of signal formation, the Monte Carlo (MC) approach has become the most recommended strategy to achieve reliable predictions of the dynamic properties of particle detectors in realistic settings such as in-beam experiments.

In my contribution I will give an overview of the key aspects characterizing MC tools, with special mention to the Garfield++ simulation toolkit.

To this aim, I will go through the analysis of some specific case studies concerning the design of silicon particle detectors for timing and 4D-tracking in present and future high-energy physics experiments, presenting the comparison between measured and simulated figures of merit and highlighting strengths and open challenges of such approach.

The examples are intentionally chosen among the family of Monolithic Active Pixel Sensors because it represents one of the most promising and topical frontiers in particle detection and because the CMOS monolithic integration offers the widest workbench possible to test the robustness of the numerical design.

Auteur principal: MANDURRINO, Marco (INFN Torino)

Orateur: MANDURRINO, Marco (INFN Torino)

Classification de Session: Sensing materials & Radiation tolerance

Classification de thématique: Invited speakers