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Simulating monolithic active pixel sensors using generic doping profiles

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Optimisation of the sensitive region of CMOS sensors with nonlinear electric fields requires precise simulations, which can be achieved by a combination of finite-element electrostatic field simulations and Monte Carlo methods. Exact predictions of the behaviour of monolithic active pixel sensors produced using commercial CMOS imaging processes are difficult to make, as the detailed electric field configuration in the sensitive material is highly dependent on the extent and concentration of different doping regions in the silicon, which may be proprietary information.

This talk aims to demonstrate that by making basic assumptions and performing simulations based on the fundamental principles of silicon detectors and using generic doping profiles, performance parameters of MAPS can be inferred and compared for different sensor geometries. A procedure for this utilising Sentaurus TCAD and Allpix Squared will be described, serving as a toolbox for performing sensor response simulations without detailed knowledge of the sensor doping concentrations and manufacturing process.

Will the talk be given in person or remotely?

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Session Classification: Applications and studies