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Simulation of the H2M MAPS

Thursday 23 May 2024 10:50 (25 minutes)

Monolithic CMOS sensors integrate the sensing volume and the processing electronics in the same silicon die, leading to complex structures with hundreds of small size features per pixel (sensor diode, transistors, metal wires...). In addition, the electric field in such sensors cannot be accurately expressed analytically as it is highly dependent on the shape and concentration of doping regions. TCAD simulations are thus required to compute the electric field prior to any further study. Most details of the structure such as the CMOS part are often not implemented in the TCAD simulation in order to reduce complexity and focus on the sensing part. While this approach is almost always justified by the independence of the two parts, the H2M, a 35um pitch monolithic sensor, exhibits a limit to this method: while the sensing volume is designed to be symmetric, measurements show a clear asymmetry of the detection efficiency.

This contribution explains how TCAD and Allpix² simulations helped to qualitatively reproduce the measurement and corelate the observed asymmetry with the layout of the electronics. Ongoing work to improve matching with the measurements will also be presented as well as lessons learned in the process, with a focus on the differences compared to a standard CMOS simulation flow.

Will the talk be given in person or remotely?

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