Contribution ID: **103** Type: **Oral Presentations**

Transient Studies using a Technology Computer-Aided Design and Allpix Squared combination approach

Thursday, 7 September 2023 11:40 (20 minutes)

The goal of the TANGERINE project is to develop the next generation of monolithic silicon pixel detectors using a 65 nm CMOS imaging process, which offers a higher logic density and overall lower power consumption compared to previously used processes. A combination of Technology Computer-Aided Design (TCAD) and Monte Carlo (MC) simulations are used to understand the physical processes within the sensing element and thus the overall performance of the pixel detector. The response of the sensors can then be tested in laboratory and test beam facilities and compared to our simulation results.

Transient simulations allow for studying the response of the sensor over time, such as the signal produced after a charged particle passes through the sensor. The study of these signals is important to understand the magnitude and timing of the response from the sensors and improve upon them. While TCAD simulations are accurate, the time required to produce a single pulse is large compared to the here used approach. The combination of MC and TCAD simulations reduces the simulation time and thus allows for studies that are not possible with an TCAD alone approach such as Landau fluctuations or secondary particle production. In this approach, electrostatic fields from TCAD are imported into the Allpix Squared framework, a simulation framework for semiconductor radiation detectors, and through the use of the Shockley-Ramo Theorem, the pulses induced from charges moving through the sensor are calculated.

In this contribution, the advantages of this approach and the resulting pulses obtained from the MC and TCAD simulations used as validation between the two methods, preliminary time resolution studies obtained at the DESY-II Test Beam facility, and a comparison with simulations will be presented.

Primary author: DEL RIO VIERA, Manuel Alejandro (Deutsches Elektronen-Synchrotron (DESY))

Co-authors: Dr SPANNAGEL, Simon (Deutsches Elektronen-Synchrotron (DESY)); Prof. GREGOR, Ingrid-Maria (Deutsches Elektronen-Synchrotron (DESY)); Dr WENNLÖF, Håkan (Deutsches Elektronen-Synchrotron (DESY)); Dr VELYKA, Anastasiia (Deutsches Elektronen-Synchrotron (DESY))

Presenter: DEL RIO VIERA, Manuel Alejandro (Deutsches Elektronen-Synchrotron (DESY))

Session Classification: F5