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# TCAD simulations of signal sharing in DC-RSD LGAD devices for future 4D tracking

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Future high-energy physics experiments will consider measuring concurrently the location and the time of a particle hit with very good accuracy, i.e., 4D trackers should be the basic option for future detection systems. Within this framework, DC-coupled Resistive Silicon Detectors (DC-RSD), an evolution of the AC-coupled design, are considered a very promising option. They combine two different design innovations, Low-Gain Avalanche Diode (LGAD) and resistive readout (RSD), to achieve a spatial resolution of a few micrometres using large pixels (150-200 μm), providing an excellent time resolution (~30 ps).
The concept of DC-RSD has been finalised using an innovative mixed-mode approach to simulation: SPICE-based fast modelling to derive the sensor design parameters, followed by full 3D TCAD simulations of the sensor behaviour. In particular, TCAD simulations have been an excellent tool not only to understand the sensor operation, but also to design and optimise this innovative class of detectors. This involved the evaluation of different technology options (e.g., the resistivity of the n+ layer, contact materials) and geometrical layouts (shape and distance of the readout pads), aiming to obtain a better control on signal spreading, and thus the use of DC-RSD sensors in high-occupancy applications.
This contribution reports the latest TCAD simulation outcomes, which have been instrumental for the definition of the design technical implementation and the first DC-RSD production at FBK, to be submitted in the summer.

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