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Innovative DC-coupled Resistive Silicon Detector for 4D tracking

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In the past 10 years, two design innovations, the introduction of low-gain (LGAD) and of resistive read-out (RSD), have radically changed the performance of silicon detectors. The LGAD mechanism, increasing the signal-to-noise ratio by about a factor of 20, leads to improved time resolution (typically 30 ps for a 50-micron thick sensor), while resistive read-out, sharing the collected charge among read-out electrodes, leads to excellent spatial resolution even using large pixels (about 15 microns for 450-micron pixel size).

This contribution presents the design strategy and the first results of the latest design evolution of silicon sensors for 4D tracking, the DC-coupled Resistive Silicon Detector (DC-RSD). The DC-RSD is a thin LGAD with a resistive DC-coupled read-out. This design leads to signal containment within a predetermined number of electrodes using isolating trenches (TI technology). Several test structures and application-oriented devices have been implemented in the wafer layout. The sensors, produced at FBK in the framework of the 4DSHARE project, have been fully characterized with a laser TCT system and recently tested at DESY with an electron beam.

The study of first prototype production will provide us with immediate feedback on the soundness of the DC-RSD concepts.

Primary experiment

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