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LIGHTWEIGHT EMBEDDING AND INTERCONNECTION OF FLEXIBLE ULTRA-THIN SILICON DETECTORS

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Silicon sensors play a crucial role in High-Energy and Nuclear Physics (HEP & NP) experiments, providing high-precision position and timing measurements for traversing particles. Their utilization is essential for achieving the physics program goals of most ongoing and future NP and HEP
experiments. In the future of nuclear and particle physics research, it is imperative to instrument large areas with silicon sensors to enable a comprehensive 4-dimensional reconstruction of particles and their decay products, encompassing position and time.
In order to overcome the fragility of modern paper-thin silicon pixel detectors, like the ALICE ITS3 MAPS sensors, that are fabricated in deep submicron CMOS processes, we propose the development of a lightweight embedding process into thin polymer foils. This process will provide mechanical stability as well as electrical connections for power and data transfer into and out of the embedded sensor assembly while fully maintaining the flexibility of the thinned silicon. As such, this will ultimately enable the large-scale application of ultra-thin large-area silicon sensor technologies. Moreover, such highly resistant and low-power embedded sensors have broad applications in biomedical, environmental, and material science fields, as well as in ongoing and future low-energy experiments.

Early Career

No

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