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## Thin film particle tracking detectors

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Thin film technology such as chemical vapor deposition and atomic layer deposition can deposit a variety of materials with high precision over large areas. Thin film detectors incorporate semiconducting materials for the sensing layer and also potentially electronic elements into a monolithic design. Fabrication of thin film detectors is possible on large, flexible substrates which can scale to cover large areas (>100m<sup>2</sup>) of detectors. These detectors have the potential to build upon their unique properties and offer advantages such as faster response times, operation without cooling, radiation hardness, and less dead detector material. To explore this possibility, three promising semiconductors were chosen from the list of candidates and tracking detectors were fabricated with single crystal materials: indium phosphide, cadmium zinc telluride, and diamond. The resulting detectors were tested in-lab using radiation sources, as well as the high-energy proton beam (120 GeV) from the Fermilab test beam facility. Of the fabricated detectors, the indium phosphide detector showed very fast response time of ~ 250 picoseconds and a pulse amplitude of ~50 mV under room temperature operation.

### Early Career

Yes

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