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Detector-on-Flex Packaging for Spectroscopic Applications

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Integrating and packaging silicon detectors can be challenging due to constraints such as size, material compatibility, and system complexity. Choosing the right packaging solution is crucial for simplifying detector integration in custom applications.
This work presents an alternative approach developed and used in our laboratories for silicon detector packaging, where the detector is directly mounted on a commercial flexible printed circuit board (flex-PCB). Similar to conventional detector-on-PCB designs, the flex-PCB hosts essential passive components for power and signal filtering, a preamplification circuit, and a standard flat-flex cable (FFC) connector for back-end electronics. To ensure structural integrity and efficient thermal management, a metal frame is incorporated, serving as both a mechanical support and a thermal interface.
Compared to traditional detector-on-PCB systems, this approach offers several advantages, including an open backside for the detector, a reduced material budget in the active area, shorter input pad connections, improved thermal performance, better coefficient of thermal expansion (CTE) matching, and lower thermally induced stress. Additionally, its modular design makes it well-suited for scalable system integration and prototyping, allowing for easy adjustments in back-end systems without compromising the detector assembly.
As an example a monolithic 4 channel SDD detector has been integrated with the above described methodology and the resulting subsystem will be shown.

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