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Large moment of inertia structures to reduce mass and improve performance of silicon detectors

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While HEP silicon detectors have embraced next generation materials, including carbon fibers, foams, and advanced resin systems, they have been slow to capitalize on the design freedom offered by composite fabrication techniques. In particular, limited use has been made of large moment of inertia structures for coupling sensors together in anything but simple shells. By creating high inertia, thin section substructures that are self-supporting, silicon detectors can reduce mass while simultaneously increasing stiffness and stability, and even obviate the need for redundant or global support structures. Design paradigms and figures of merit for such high inertia structures will be presented, In addition to potential novel fabrication techniques, such as Resin Transfer Molding, which may be ideally suited to this genre of fabrication.

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