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## The Silicon Electron Multiplier

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Silicon sensors for the future generation of collider physics experiments will require high performances on spatial ( $< 10 \mu\text{m}$ ) and time resolution (20-50 ps) with a radiation tolerance up to fluences of  $10^{17} \text{ n}_{eq}$ . To meet these challenges, a new silicon sensor architecture has been proposed, enabling internal gain without relying on doping, the Silicon Electron Multiplier (SiEM). The SiEM incorporates a set of metallic electrodes within the silicon substrate which are used to create a high electric field region that provides charge multiplication. Simulations of SiEM configurations with TCAD and Garfield++ show a promising performance with a gain exceeding 10. Metal assisted chemical etching is a process shown to be compatible with the desired geometry, and is used to make a demonstrator. Results from a production comprising pillars with a radius of 500nm and a height of up to  $8 \mu\text{m}$  on a hexagonal grid with a  $1.5 \mu\text{m}$  pitch will be presented along with key results from the simulations.

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