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Preliminary tests of innovative thin silicon detectors for beam monitoring in particle therapy.

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Purpose. For beam monitoring in particle-therapy, silicon detectors could overcome limitations of ionization chambers. In particular, silicon sensors with internal gain (Ultra Fast Silicon Detectors, UFSDs) provide high signal-to-noise ratio and fast collection times ($\sim 1\text{ns}$ in $50\mu\text{m}$ thickness) allowing single particle counting. Beam energy can be measured with time-of-flight techniques.

Methods. Two UFSD pads (1mm^2) aligned along a proton beam are used to test UFSD counting and timing properties at therapeutic fluxes.

Results. Measurements showed well separated signals with low pile-up. Number of particles, beam flux, and crossing time were determined obtaining a time resolution $\sim 50\text{ps}$ for single crossing.