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Picosec: optimization of a fast timing detector for its application at a future muon collider experiment

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The Micropattern Gaseous Detectors (MPGDs) boast excellent spatial resolution performance. However, they typically exhibit modest time resolution due to fluctuations in the position where ionization occurs within the gas. Picosec addresses this issue by operating based on the amplification, via a Micromegas, of electrons generated by the conversion of Cherenkov light produced from an incident particle on a radiator crystal. Picosec achieves resolutions on the order of tens of picoseconds in this manner. The ongoing study aims at optimizing this technology for its application in future experiments at the Muon Collider. This optimization involves evaluating performance using different radiators, various photocathodes, and new-generation gas mixtures that also have a reduced environmental impact. Additionally, the study will outline future prospects, particularly focusing on the scalability of this technology.

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