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Optimization of the Picosec-MM detector for a Muon Collider experiment

Colliders are essential for exploring the Standard Model, and a new generation of machines with higher center-of-mass energy and increased luminosity is required. In this context, the Muon Collider (MC) could represent a breakthrough, combining the advantages of proton colliders and electron ones. From a detector perspective, the main challenge of an MC experiment is the beam-induced background (BIB), originating from muon decays and from interactions of decay products with surrounding materials. A useful BIB feature is its broad time distribution compared to the signal, enabling rejection through timing cuts using fast timing detectors. PICOSEC is one proposed technology: a Micro-Pattern Gaseous Detector (MPGD) achieving tens of ps of time resolution, exploiting Cherenkov light and double-stage amplification. This poster will focus on the optimization of this technology, particularly by identification of a new gas mixture to replace the current expensive, flammable, and high-GWP one.

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