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Picosec R&D towards Muon Collider applications

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Picosec R&D towards Muon Collider applications –Matteo Brunoldi, endorsed by the International Muon Collider Collaboration, on behalf of the Picosec Micromegas Collaboration
The Muon Collider (MC) offers significant potential in high-energy physics by combining the benefits of leptonic and hadronic colliders. However, key challenges remain, including the Beam-Induced Background, which arises from particles produced by muon decay and their interactions with materials. This background makes the reconstruction of the muon tracks challenging. A proposed solution is to reverse the traditional track reconstruction method, starting from the outer muon spectrometer and moving inward. This out-to-in approach reduces background interference. Additionally, since background particles have a wider spread in arrival time, fast-timing detectors in the muon spectrometer can apply a time-based cut to further suppress the background. Picosec, a Micro-Pattern Gaseous Detector (MPGD), has been proposed for the muon spectrometer's endcap. Picosec offers exceptional time resolution (<25 ps) by utilizing Cherenkov radiation and a two-stage amplification process. Ongoing R&D focuses on optimizing Picosec, including testing environmentally friendly gas mixtures to replace the current one, which has a high Global Warming Potential (GWP). This contribution will present the latest results from gas mixture studies and ongoing efforts to adapt the detector for future MC experiments.

Primary experiment

IMCC, Picosec Micromegas Collaboration

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