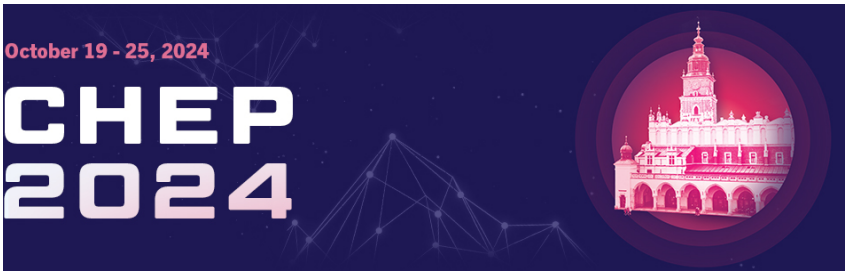

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Simulation of a MPGD-based hadronic calorimeter for Muon Collider experiments

Wednesday 23 October 2024 16:00 (15 minutes)

The proposal to create a multi-Tev Muon Collider presents an unprecedented opportunity for advancing high energy physics research and offers the possibility to accurately measure the Higgs couplings with other Standard Model particles and search for new physics at TeV scale.
This demands for accurate full event reconstruction and particle identification. However, this is complicated by the beam induced background (BIB), originating from the decays of the muons of the beam, that represents one of the major challenges for the experiment design and that poses potential limitations on the detector performances and requirements on radiation hardness. The discrimination of signal showers from the BIB requires high granularity, superb energy resolution and precise timing. The calorimeter should thus provide 5D measurement (3D position, time and energy).
To address these challenges, an innovative hadronic calorimeter has been designed that utilizes Micro Pattern Gas Detectors (MPGDs) as active layers. MPGDs are ideal for high radiation environments and offer high granularity for precise spatial measurements. The response of such MPGD-based HCAL to the incoming particles is studied and presented in this contribution with Monte Carlo simulations performed using GEANT4, comparing the performance of a digital and semi-digital readout and considering the energy resolution as a figure of merit.
This contribution details the design and optimization of the MPGD-based hadronic calorimeter, and shows a comparison of the simulated performance with preliminary experimental data. This project is endorsed by the International Muon Collider Collaboration.

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