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Optimising an ECAL barrel for a Muon Collider: the Crilin design

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Among future collider concepts, the Muon Collider presents a groundbreaking opportunity to push the energy frontier. However, its realization comes with a major challenge: Beam-Induced Background (BIB), a byproduct of muon decay along the beam pipe, which significantly complicates detector design and event reconstruction. Despite the implementation of tungsten conical absorbers (nozzles) in the forward regions, a persistent component of BIB still reaches the detector, consisting of low-momentum particles with delayed arrival times relative to the primary collisions. This background is particularly severe for the electromagnetic calorimeter, where the barrel's inner face experiences an intense particle flux of approximately 300 particles per cm², a total ionizing dose of ~1 kGy/year, and a neutron fluence of 10^{14} n/cm² per year.

To fully exploit the potential of a Muon Collider, a calorimeter capable of mitigating BIB while maintaining excellent energy resolution is crucial. One promising solution is CRILIN (CRystal calorImeter with Longitudinal INformation), a semi-homogeneous electromagnetic calorimeter utilizing Lead Fluoride (PbF_2) crystals read by UV-extended Silicon Photomultipliers. Engineered for high granularity, longitudinal segmentation, and exceptional timing performance, CRILIN is designed to suppress BIB-induced effects while delivering high energy resolution (<10%/√E). This talk will present simulation studies assessing CRILIN's capabilities, along with recent experimental results from prototype testing, demonstrating its viability in the demanding Muon Collider environment.

Muon dipole moments (magnetic and electric): theory, experiments and future perspectives

Charged lepton flavor violation: theory, experiment and future perspectives

New Physics opportunities with low and high energy muon beams

Neutrino physics with muon beams: theory, experiments and future perspectives

Muons beams technologies: production, cooling and acceleration at different energy

Advancements in Muon-based Facilities and Broader Applications

none

Muons in other fields: muography, muon spin spectroscopy, muon-catalyzed fusion

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