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PICOSEC-Micromegas Detector, an innovative solution for Lepton Time Tagging

Friday, 31 May 2024 11:00 (20 minutes)

The PICOSEC-Micromegas (PICOSEC-MM) detector is a novel gaseous detector aiming to offer precise timing resolution in experimental measurements. The main idea is to eliminate the time jitter produced by charged particles in ionization gaps by exploiting extreme UV Cherenkov light emitted in a crystal, which is then detected by Micromegas photodetector using an appropriate photocathode. The proof of concept of such detectors was achieved by single-channel prototypes, in muon beams of 150 GeV/c, resulting on a timing resolution of 25 ps, a performance surpassing by two orders of magnitude the best resolution reached by gaseous detectors. Using the PICOSEC-MM detector in experimental measurements of high-energy physics means being able to build robust and efficient prototypes together with a modular design. In this work, we are identifying and investigating the necessary specifications for an application of such detectors in monitored neutrino beams, of the ENUBET (Enhanced Neutrino Beams from Kaon Tagging) Project. Key aspects investigated in this study, include the search for different resistive technologies and resilient photocathodes, addressing technological challenges, and developing scalable front-end/back-end electronics. To withstand the high particle flux environment, new 7-pad resistive detectors have been designed. In this project, two potential scenarios are being considered for and an innovative solution on lepton time tagging. Tagging electromagnetic showers with a timing resolution below 30 ps (embedded in an electromagnetic calorimeter as a T0 layer) or individual particles with a timing resolution of 20 ps (embedded in the hadron damp after a few radiation lengths of absorber for muon monitoring). Commissioning and testing of these two scenarios will be described.

Collaboration

DRD1-PICOSEC Micromegas Collaboration

Role of Submitter

I am the presenter

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