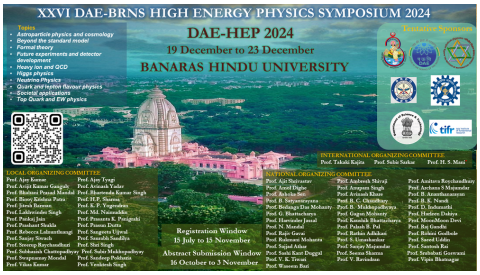

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CMS Muon System Upgrade Featuring the ME0 Module with GEM Technology for Enhanced Forward Detection in the High-Luminosity LHC

The High-Luminosity Large Hadron Collider (HL-LHC) upgrade will substantially increase the instantaneous luminosity, achieving values between 5 × 10^34 cm^{-2} s^{-1} and 7 × 10^34 cm^{-2} s^{-1}, approximately seven times the nominal level. This upgrade intensifies the particle flux, creating significant challenges for the forward sections of the Compact Muon Solenoid (CMS) detector. In response, new Gas Electron Multiplier (GEM) stations, GE2/1 and ME0, will be installed within the CMS muon system to strengthen its forward capabilities. These stations will enhance the tracking and triggering efficiency in regions with high particle flux.

The ME0 station is a pivotal addition to CMS, extending the detector's pseudorapidity coverage to the range $2.03 < |\eta| < 2.80$. This expansion takes advantage of CMS's improved inner tracking capabilities, optimizing muon identification efficiency within this extended range, especially in the extreme forward region where particle flux is highest. Built on the successful performance of GEM technology in GE1/1, ME0 is designed to meet the demanding HL-LHC environment, featuring high spatial resolution, rapid rate handling, and strong radiation resistance.

This presentation offers an overview of the CMS muon system upgrade with GEM technology, focusing on the ME0 upgrade. It covers the design, chamber production, and validation processes essential to this enhancement.

Field of contribution

Experiment

Author: PRAKASH, Chandra (University of Delhi (IN))

Presenter: PRAKASH, Chandra (University of Delhi (IN))

Track Classification: Future experiments and detector development