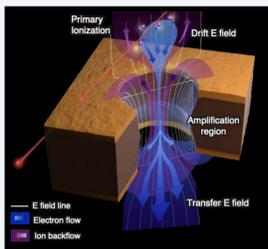


Introduction

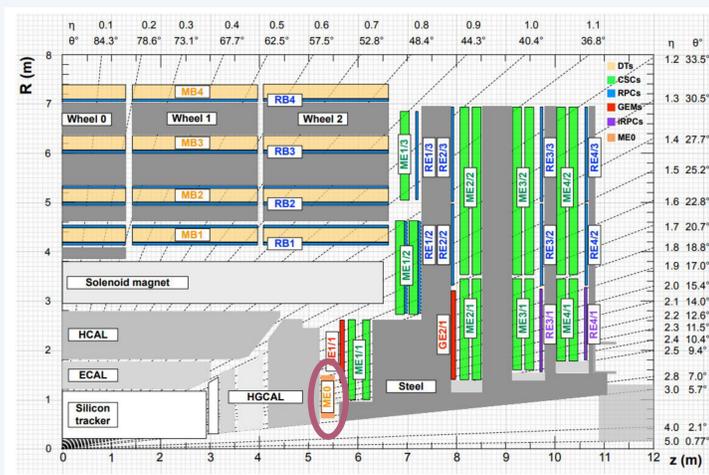
- LHC upgrade: 2.5 times more luminosity
- need higher rate muon spectrometers (GEMs) in high pseudorapidity regions
- three types of GEMs:
 - GE1/1 at $1.6 < |\eta| < 2.2$
 - GE2/1 at $1.8 < |\eta| < 2.4$
 - ME0 at $2.4 < |\eta| < 2.8$
- currently set up in GIF++ facility being tested on muon beam
- in this project, we aim to measure efficiency of ME0 detector with background

GEM Mechanism

- gaseous detector: ionizing particles create electron-ion pair
- GEM foil
 - insulating layer with conductors at different voltages on top and bottom
 - microscopic holes create sharp electric field
- electrons avalanche in gaps and create more electron-ion pairs
- electron cloud induces signal on readout strip



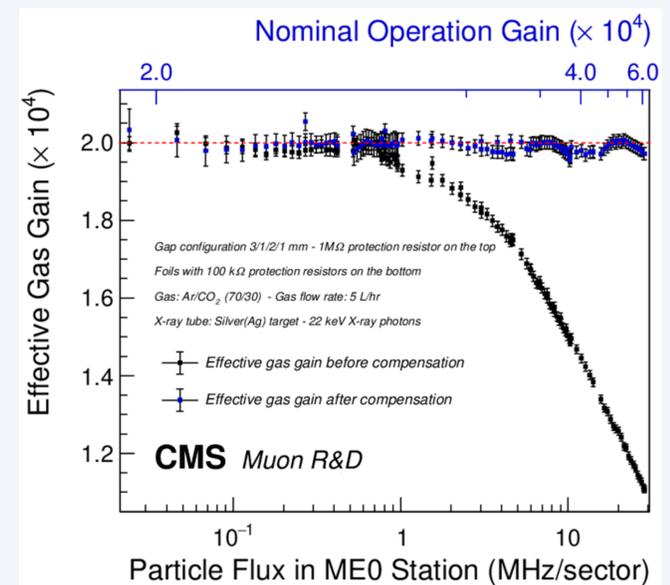
Planned Gas Electron Multiplier (GEM) Installation



- phased installation of different GEM detectors in CMS during Run 3 and LS3:
 - installed in 2019: GE1/1
 - to be installed in 2023 (EYETS during Run 3): GE2/1
 - to be installed in 2026 (LS3): ME0
- focus of current measurements is on ME0

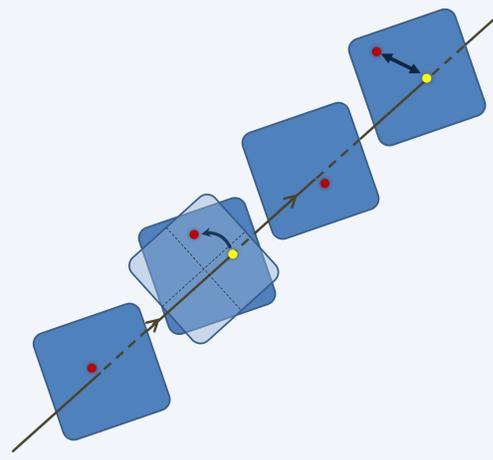
Rate capability

- expected background 150 kHz/cm^2
- rate capability of GEMs limited by voltage drops due to avalanche-induced currents
- gain compensation by overvoltage is possible but increases damage risk
- gain drop can be minimized using azimuthal sectorisation with respect to the beam axis



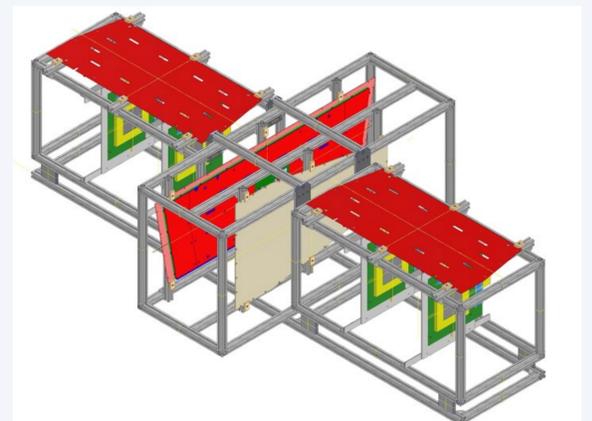
Track Reconstruction

- ME0 under test; tracks are built with remaining three chambers
- transversal and angular alignment on tracking chambers
- repeat iteratively until corrections converge
- interpolate tracks to make prediction of track in ME0 (propagated hits)
- compare to measurement in ME0 (reconstructed hits)
- the efficiency is given by the number of correctly reconstructed tracks over the total number of events

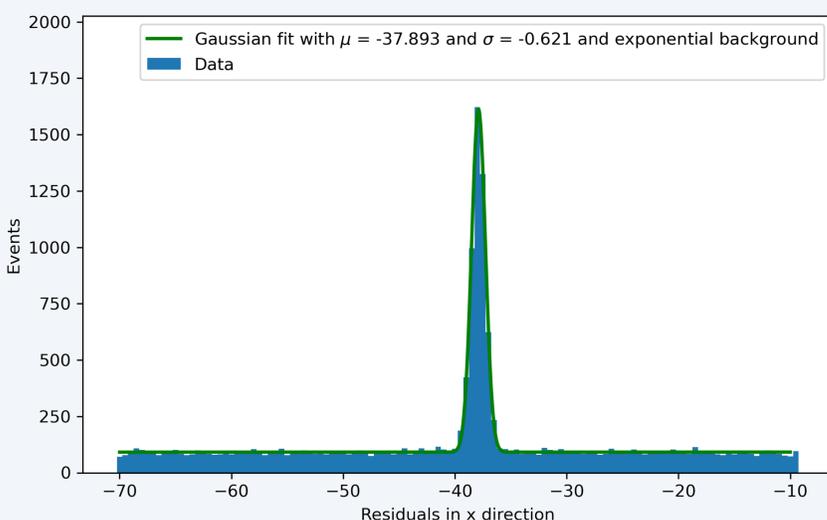


Test Beam

- 80 GeV muon beam (test setup downstream of H4 line in North area)
- artificial background by radioactive source
- ME0 detector:
 - strips of pitch 400 μrad
 - each GEM foil is divided in sectors along azimuthal direction with respect to the beam line



Spatial Resolution of ME0



- histogram of number of events in function of x -residuals is expected to be Gaussian with exponential background
- estimate of spatial resolution then given by standard deviation

Conclusion

- preliminary results are in agreement with the expected performance
- more analysis is needed to get reliable estimation of efficiency
- lots of exciting work coming up!