MFT upgrade overview

Muon Forward Tracker technology

- 5 disks equipped on both sides with silicon pixel sensors (920 ALPIDE sensors). Ladder structure: FPC + sensors.
- ALPIDE technology: Monolithic Active Pixel Sensor (MAPS), CERN/CEA development.

Beam test setup (June 2018 at CERN PS)

- ALPIDE Telescope: 3 chips (at 220, 160 and 140 mm from disk front plane).
- Trigger signal: plastic scintillators upstream.
- First hit maps from MFT disk prototype

Physics motivations

Main ALICE improvements with MFT

- Extend the open heavy flavour Physics program at large pseudo-rapidity; measurements down to low pT.
- Increase S/N ratio matching tracks with MUON Spectrometer.
- Add high-precision vertexing capabilities to the MUON spectrometer (Currently limited by the front absorber) e.g. prompt/non-prompt charmonium discrimination.

New high-precision measurements accessible thanks to MFT upgrade are summarised in the Table 1.1.

Beam test data and methods

Collected data specifications

- Total Number of reconstructed tracks: \(\sim 3 \times 10^7\).
- 2 acquisition configurations: 1 front ladder + 1 back ladder (17 runs) and 1 front + 2 back (38 runs).
- 2 back bias voltage configurations: 0V and -3V.

Resolution and efficiency calculations

- Alignment performed using Millipede with x, y, z, and \(\theta_z\) coordinates as free parameters.
- Resolution \(\sigma_{\text{raw}}\) calculated in the transverse plan in each direction (x or y).
- Horizontal direction (y):
  \[
  \sigma_{\text{y}} = \sqrt{\sigma_{\text{y}}^2 + \sigma_{\text{y}}^2 \text{mismatch}},
  \]
  where “with” and “without” mean taking into account or not the ladder point to do the tracking.
- Efficiency defined as the ratio between the number of tracks found in 2 ladders (1 back + 1 front) and the number of tracks found in the reference ladder (e.g. back = ref to estimate front eff).

Results of beam test data analysis

Resolution

- Estimated Resolution for beam test data \(\sim 7\,\mu\text{m for y direction (\sim 7.5}\,\mu\text{m for x direction).}
- Consistent with expected resolution \(\sim 4\,\mu\text{m considering multiple-scattering effects.}

Efficiency

- Estimated detection efficiency consistent with expected efficiency (> 99.5%).