System performance paper

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MICE CM 52
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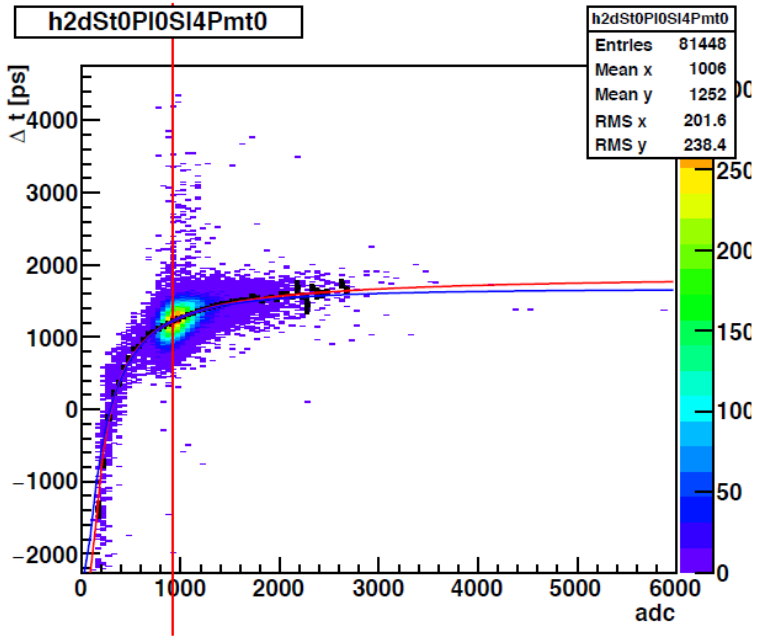
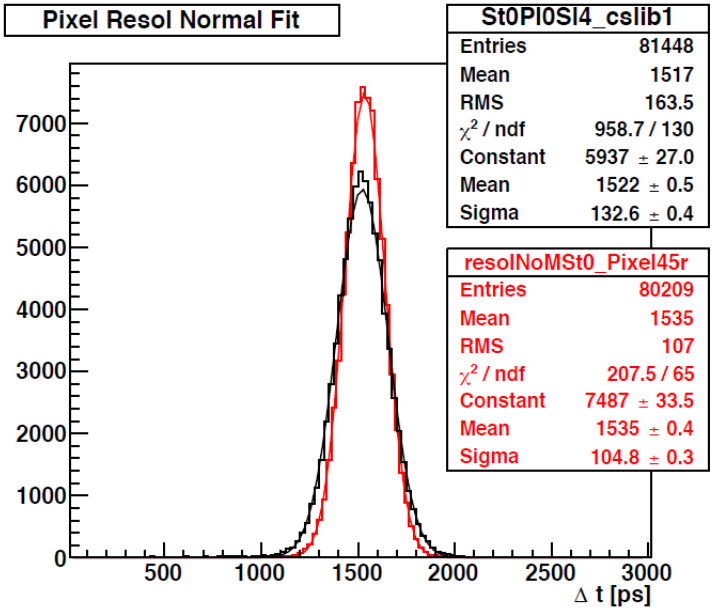
Introduction

- Draft not ready yet
- Nearly 70% of the material present
- Thanks to all the people contributing
- Many analysis still in progress
- Very last effort to have this done

TOF

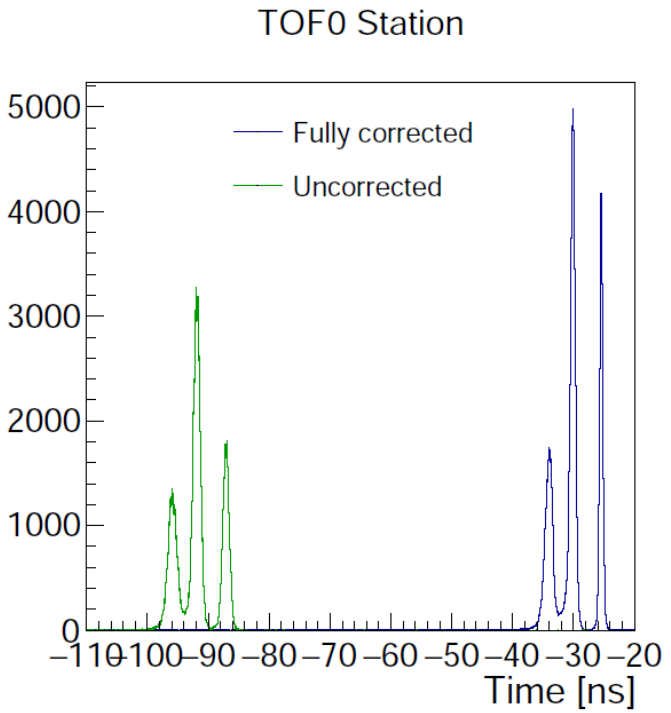
- Description of the calibration method
- Time-walk correction: improved resolution





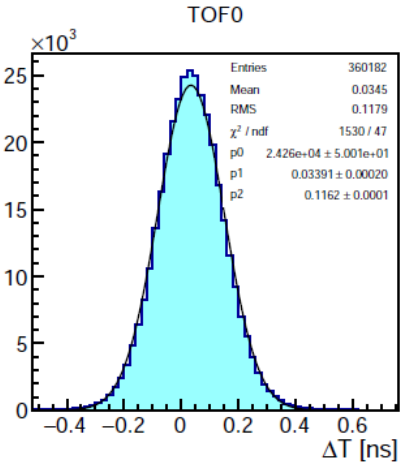
TOF

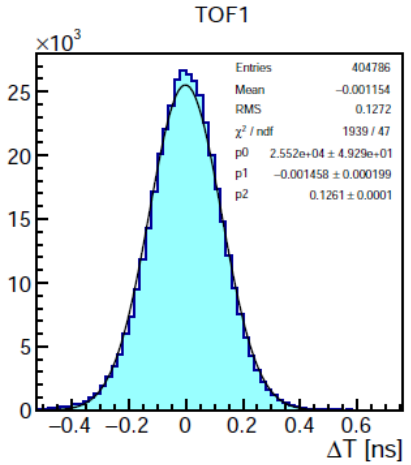
- T0 correction wrt the electron peak predicted time of flight

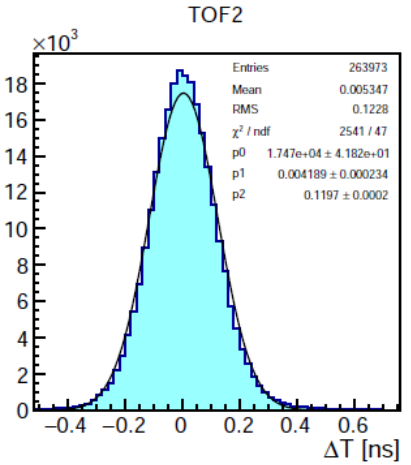


TOF

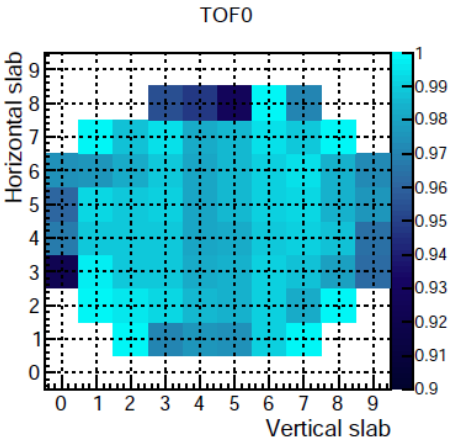
- Performance
  - ΔT

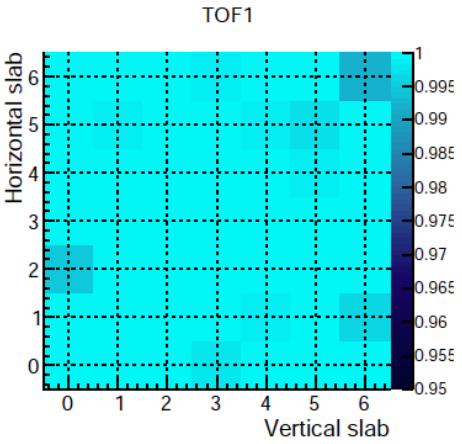


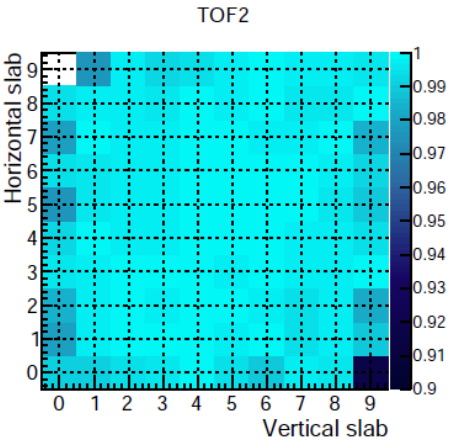




  - SP creation

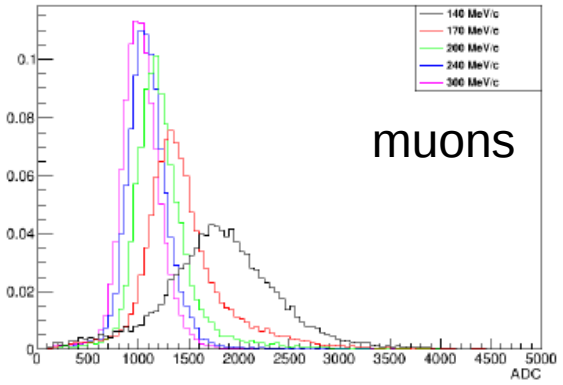


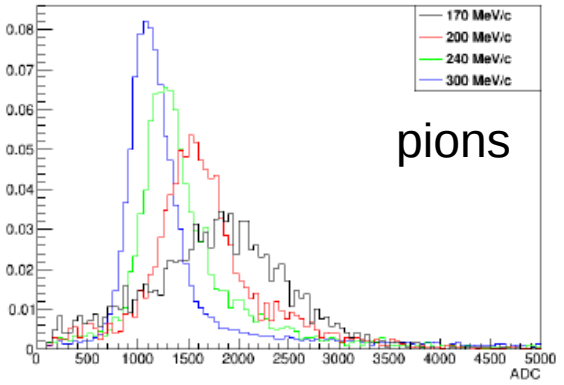


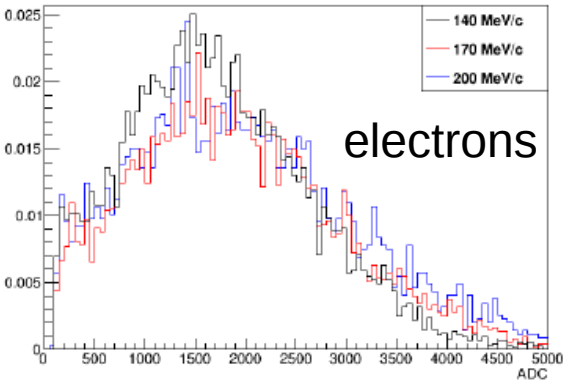


KL

- KL response







- Efficiency: signal in KL above the threshold/TOF track

species	140 MeV/c	170 MeV/c	200 MeV/c	240 MeV/c	300 MeV/c
electrons	0.95 ± 0.02	0.95 ± 0.01	0.94 ± 0.03	n/a	n/a
muons	0.97 ± 0.02	0.99 ± 0.01	0.99 ± 0.01	0.99 ± 0.01	0.99 ± 0.01
pions	n/a	0.89 ± 0.03	0.95 ± 0.03	0.97 ± 0.03	0.98 ± 0.01

EMR

- Hardware efficiency:
  - 400 MeV/c sample used
  - If P>350 MeV/c, 99.62% produce a hit (98.56% reconstructed)
- Electron rejection
  - Straight tracks of muons vs widespread positrons showers
  - PID variables:
    - Plane density
    - Normalised chi2 of a fitted straight track

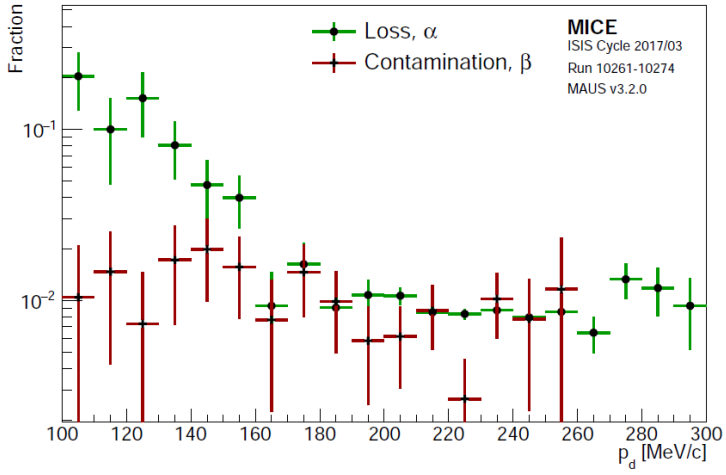


Figure 27: Percentage of electron contamination, β, and muon loss, α, for different ranges of momentum measured in the downstream tracker, p_d. The error bars are based on the statistical uncertainty in a bin.

EMR

- Muon track momentum
  - Estimate of the muon range in the polystyrene

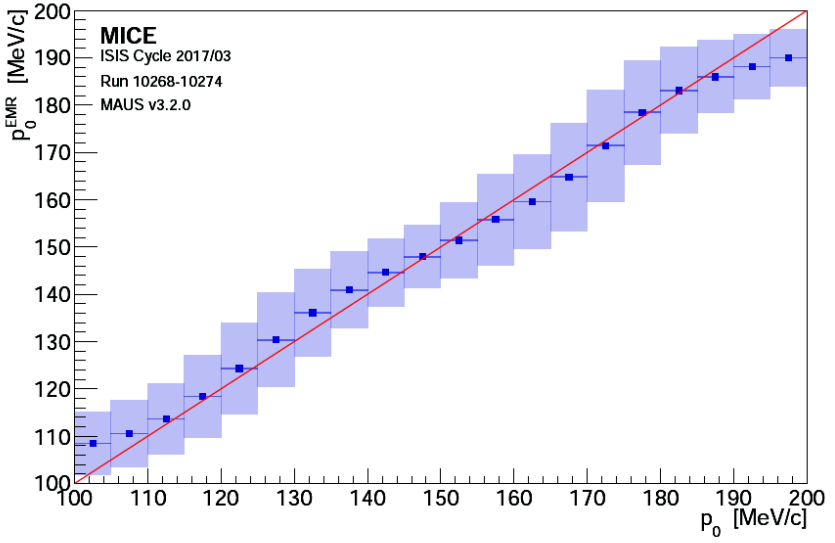


Figure 30: Momentum reconstructed in the EMR as a function of the momentum estimated at the entrance of the EMR from the time-of-flight information. The markers represent the mean in the bin, the dark band the uncertainty on the mean and the light band the RMS. The red line represents perfect agreement.

Track matching

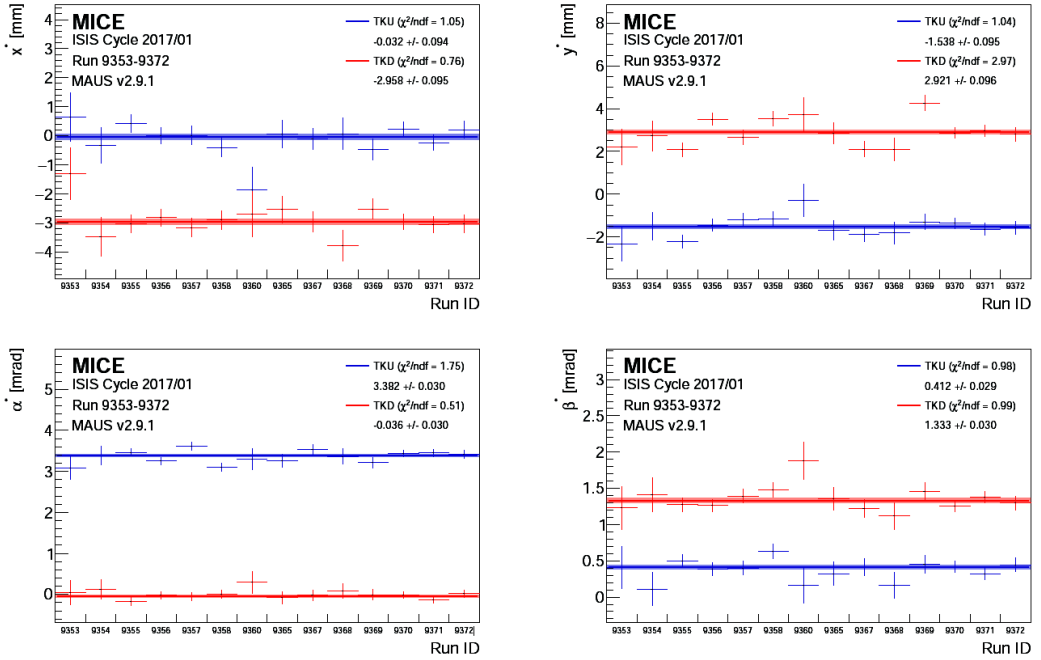
- Global reconstruction
  - tracks in the TKU extrapolated upstream (TOF0, TOF1) and downstream (TKD, TOF2)
  - Comparison of the reconstructed and extrapolated coordinates
  - Some residuals are better than others…

Track matching

- Residuals
  - x, y in TOF1
  - time in TOF0
  - x, y in TKD
  - Px, Py, Ptot in TKD
  - x, y in TOF2
  - time in TOF2

Detector alignment

- Beam-based alignment
- Analysis method
  - TOF1-TOF2 as reference axis
  - Straight tracks
  - 4 parameters



Absorber

- Contraction of the vessel
- Deflection of the windows due to pressure/weight
- Variation in density

- Systematic uncertainty on energy loss
- Systematic uncertainty on scattering?

Summary

- What is missed:
  - Tracker
  - PID
  - Ckov
- Few analysis still in progress
- Subset of contributions for this version of the paper

- https://github.com/pfranchini/MICE-systems-performance-paper