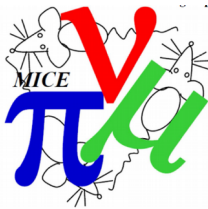


System performance paper

P. Franchini

MICE CM #53
February, 21 2019

Status of the paper



- The first draft is complete
- Reviewed the plots during the last analysis workshop
- Sent comments to the authors
 - basically plots to be redone
 - some features to be clarified
- Still room to
 - Complete the PID
 - Energy loss in IH2

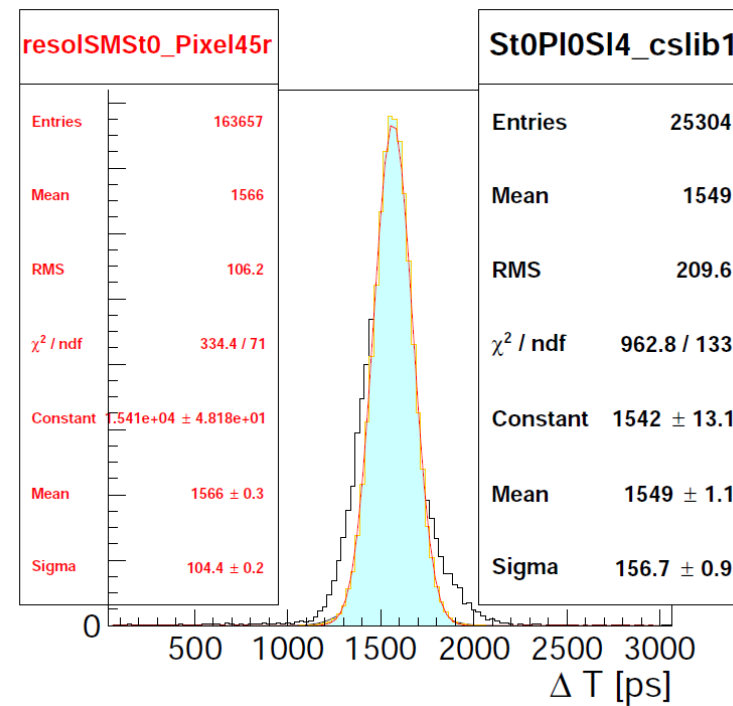
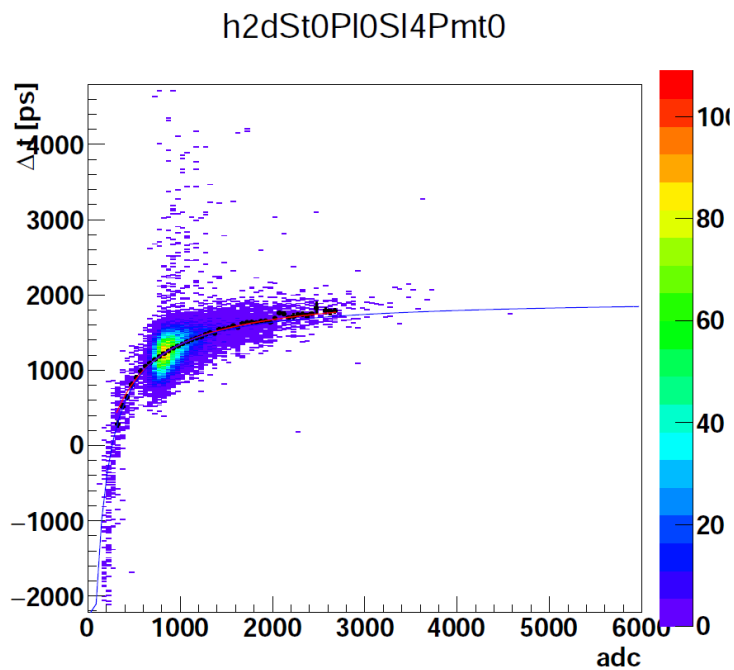
TOF



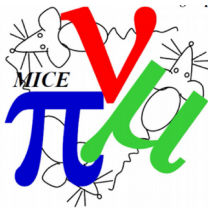
- Calibration method
 - Corrections
 - Time walk correction
 - Trigger delay correction
 - PMT channel specific delay time
 - Performance
-
- Some features to be explained
 - Layout of some plots to be improved

TOF

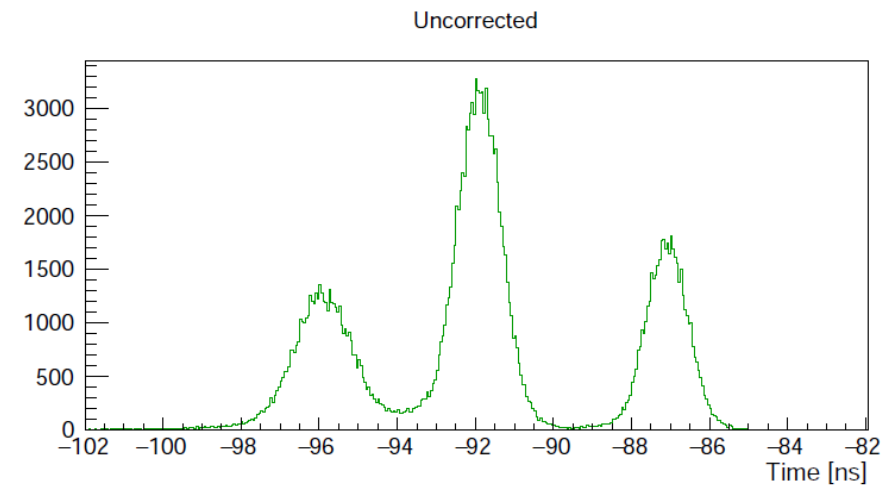
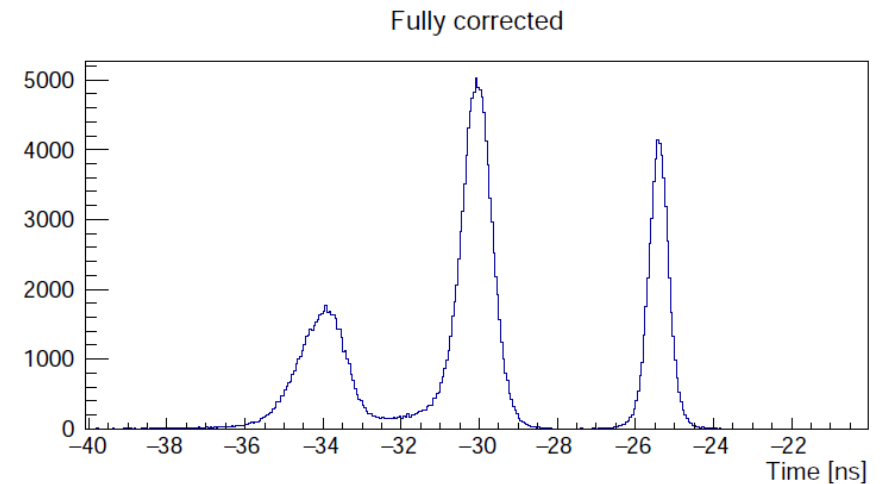
- Time walk correction
 - Δt between horizontal and vertical slabs



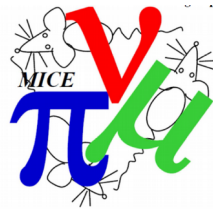
TOF



- PMT channel specific delay time
- Time distribution in TOF0
after and before the corrections

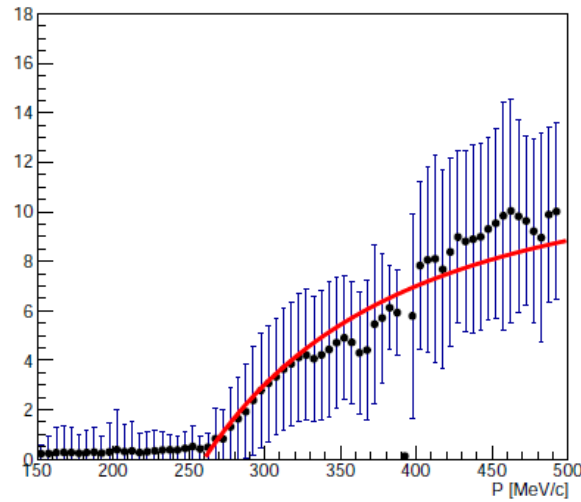


Cherenkov

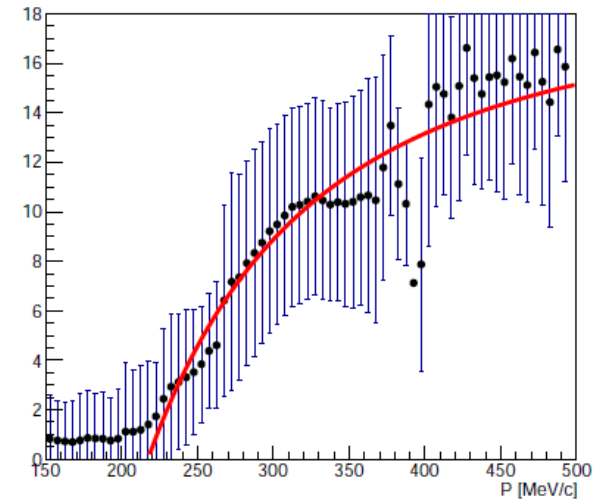


- PE yields

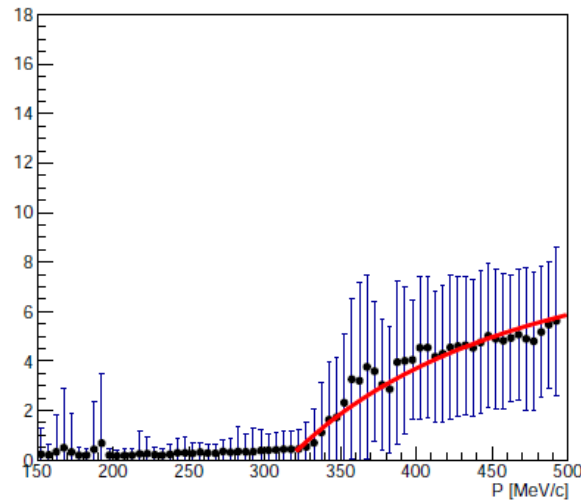
Muons: NPE vs P - CkovA



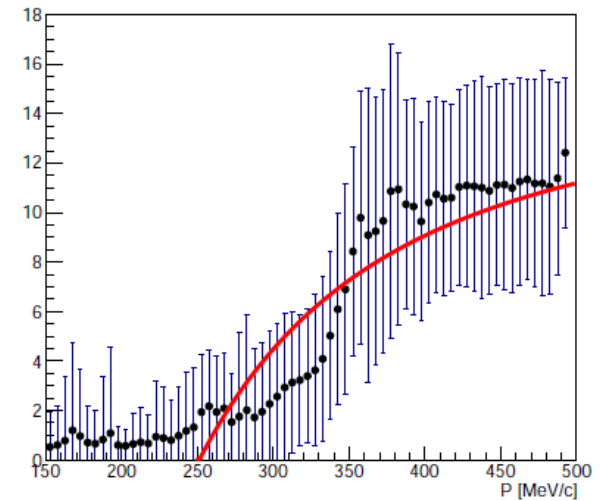
Muons: NPE vs P - CkovB



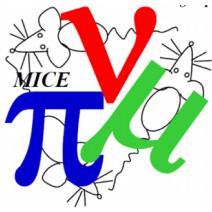
Pions: NPE vs P - CkovA



Pions: NPE vs P - CkovB



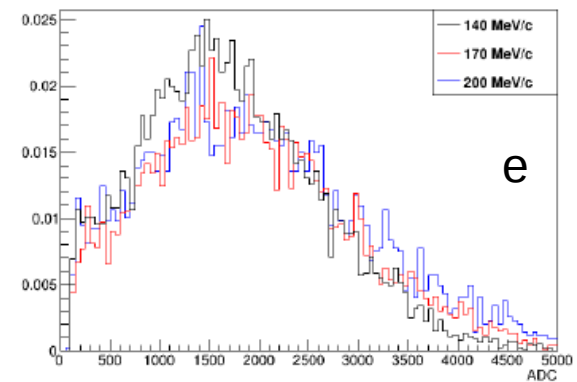
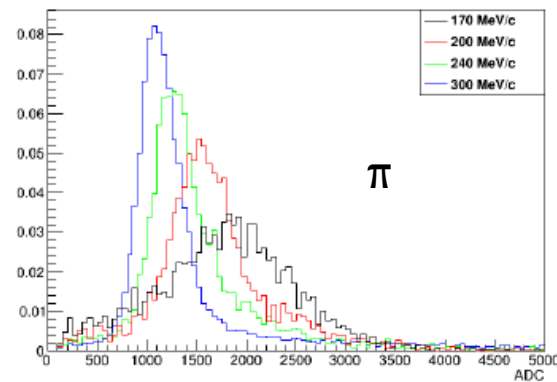
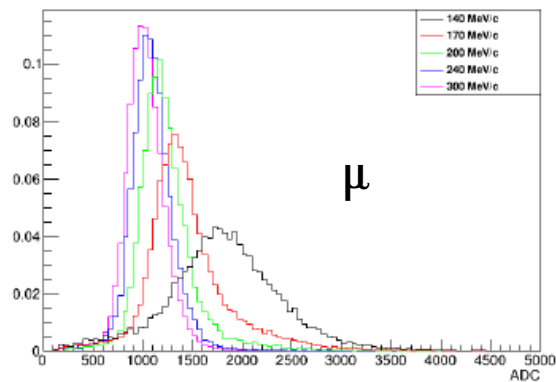
KL



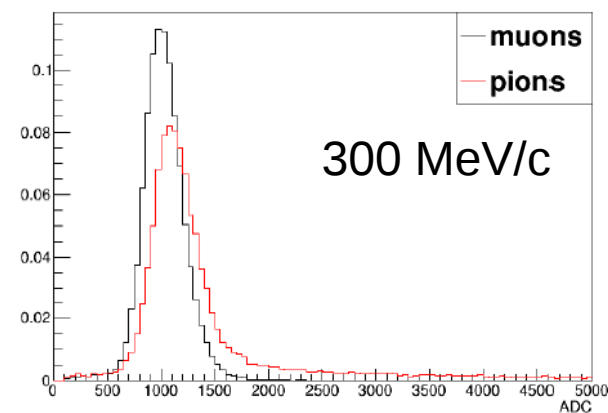
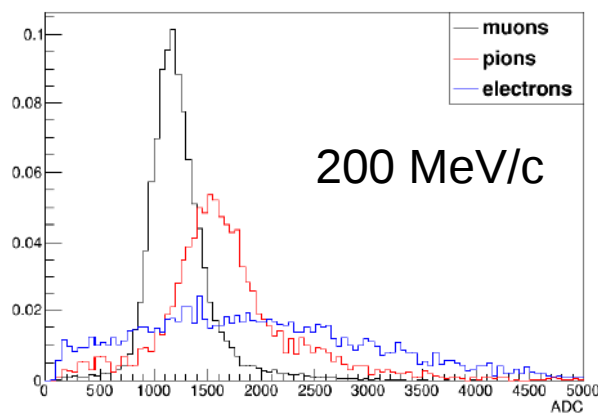
- Improve statistics for some plots
- Plots layout

KL

- Response for different P

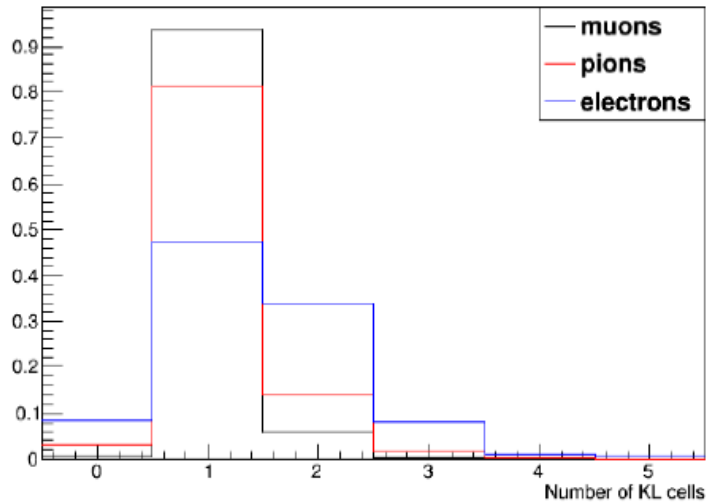


- Response for different species

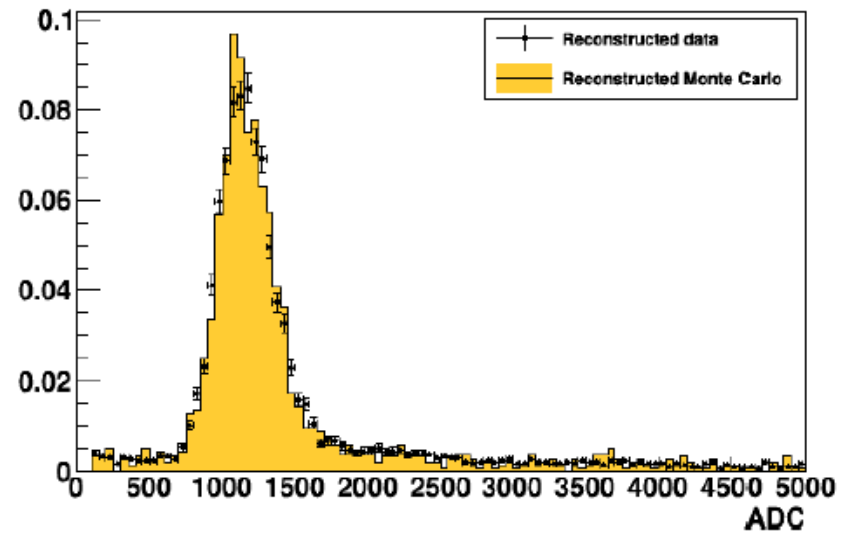
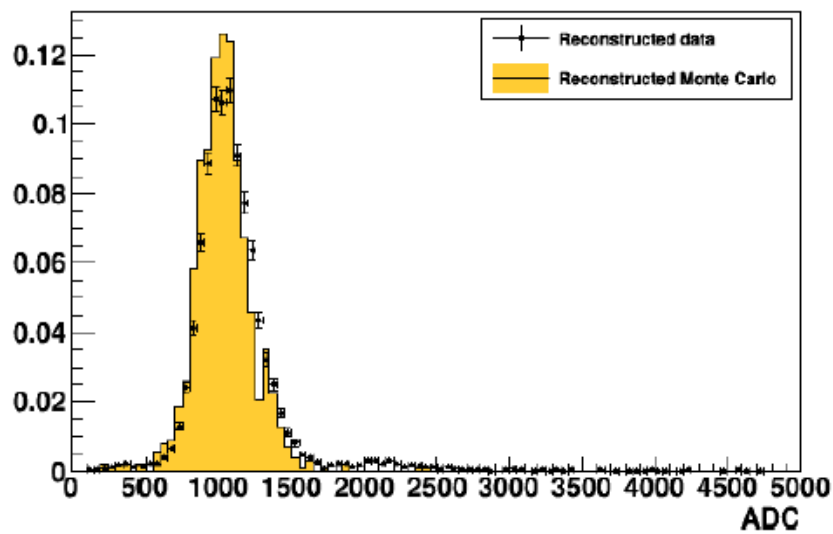


KL

- Multiplicity



- Data vs MC



EMR

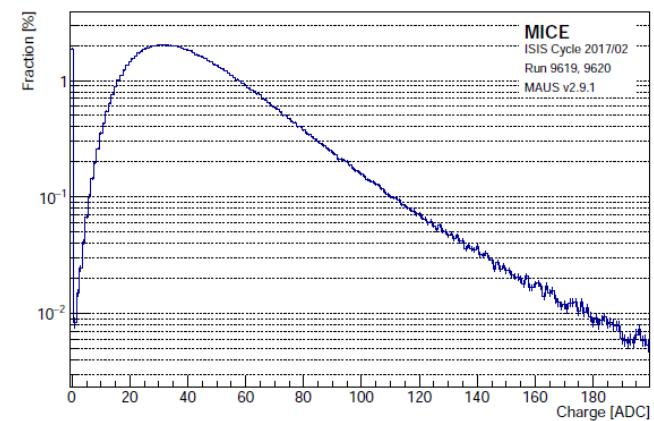
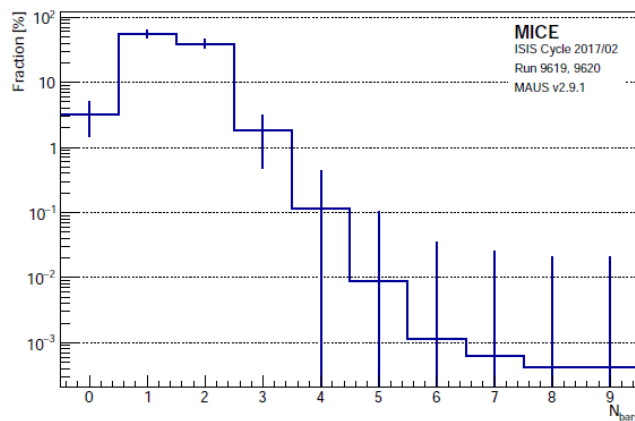


- Plots already redone with MAUS V3.2.0
- Explained some features

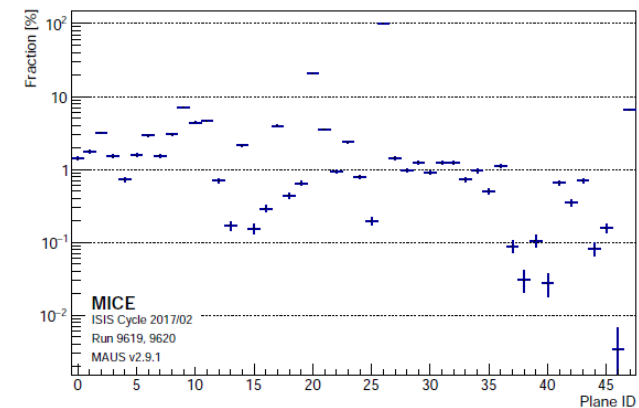
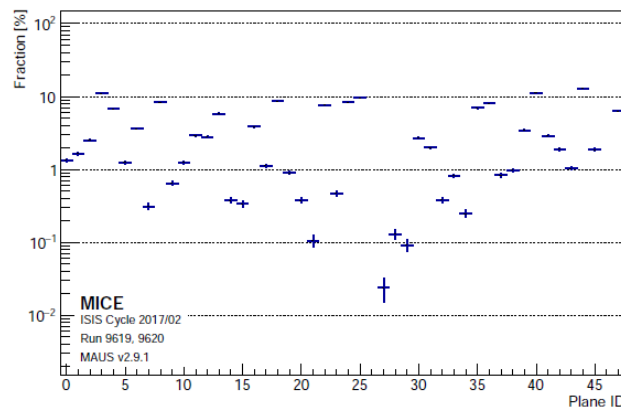
EMR



- MAPMT bar multiplicity / SAPMT charge distribution

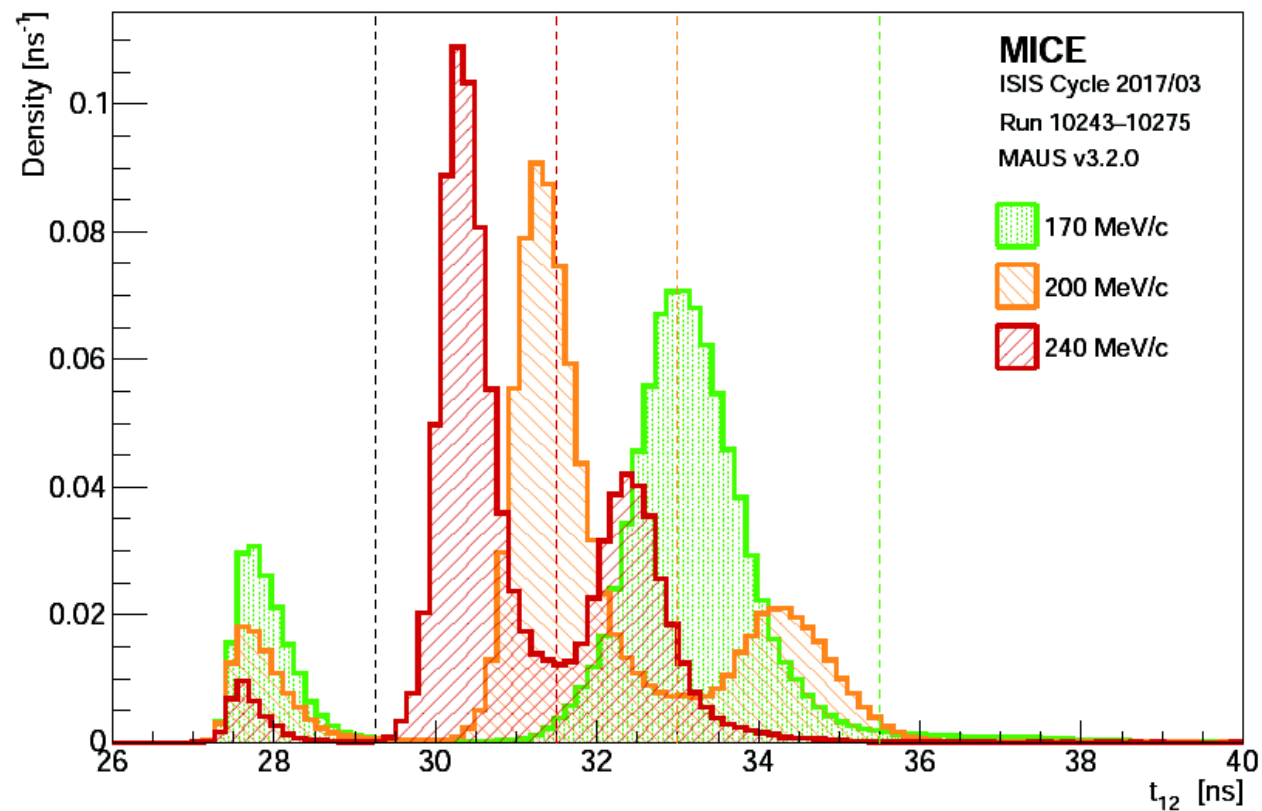


- Probability of not producing a single hit / zero charge for each single independent readout chain



EMR

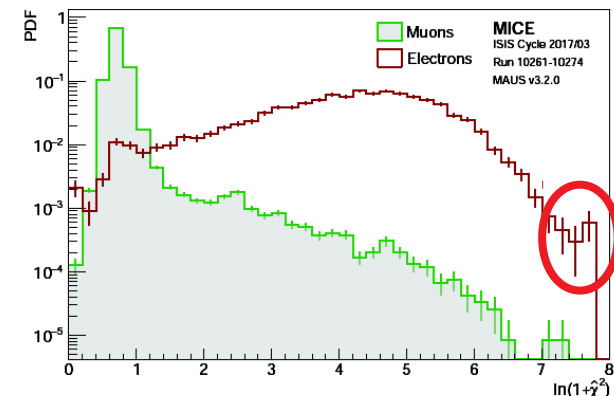
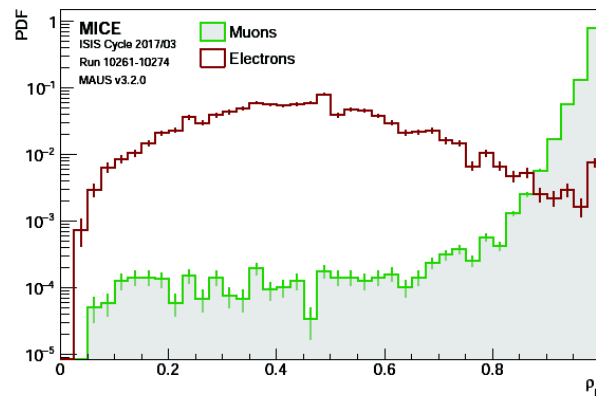
- Datasets for the EMR performance analysis (170 MeV/c pions do not make to the EMR)



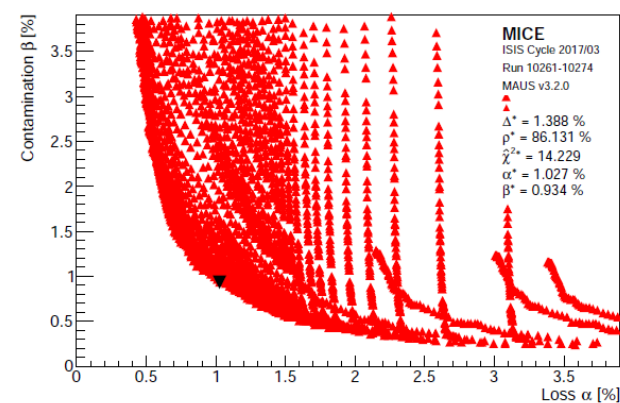
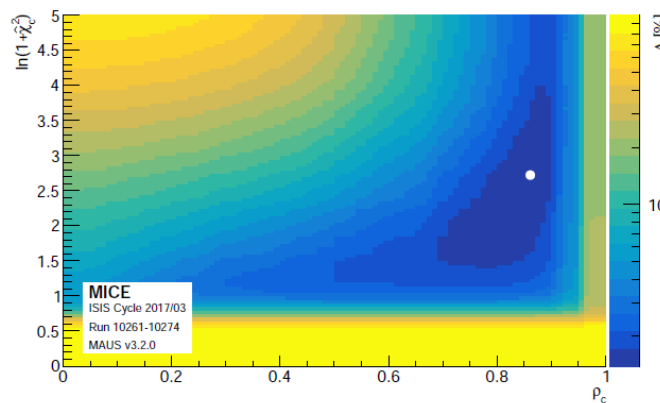
EMR

- PID variables: plane density and chi2

e^- that do not shower: short tracks



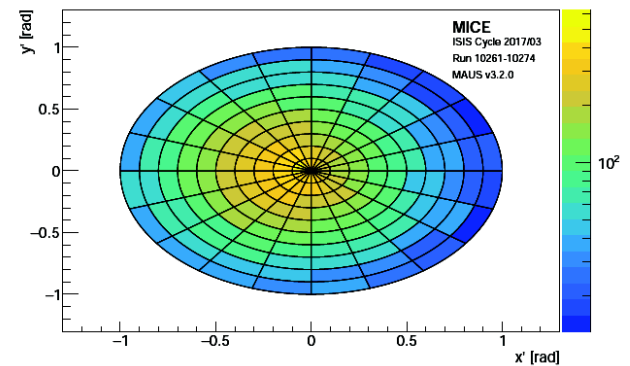
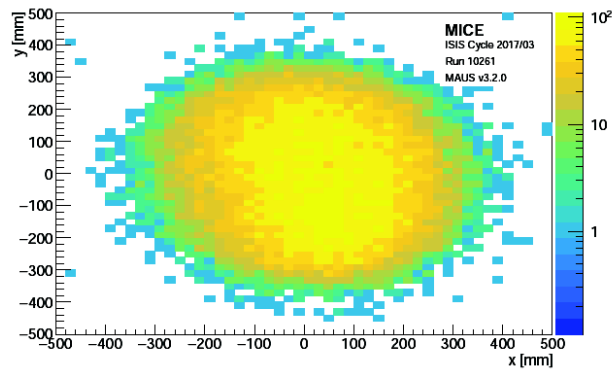
- Cost function and e tagged as μ as function of the loss of real muons



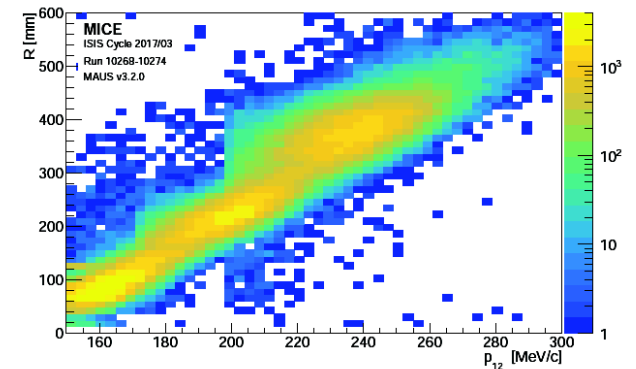
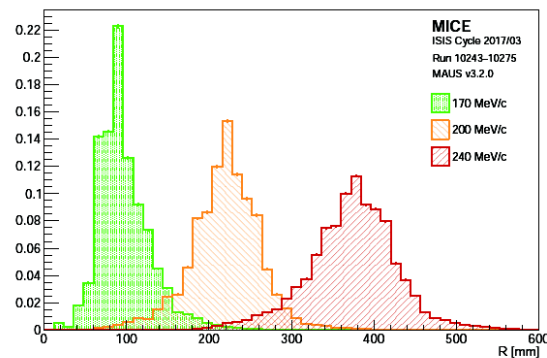
EMR



- Beam profile and track gradients



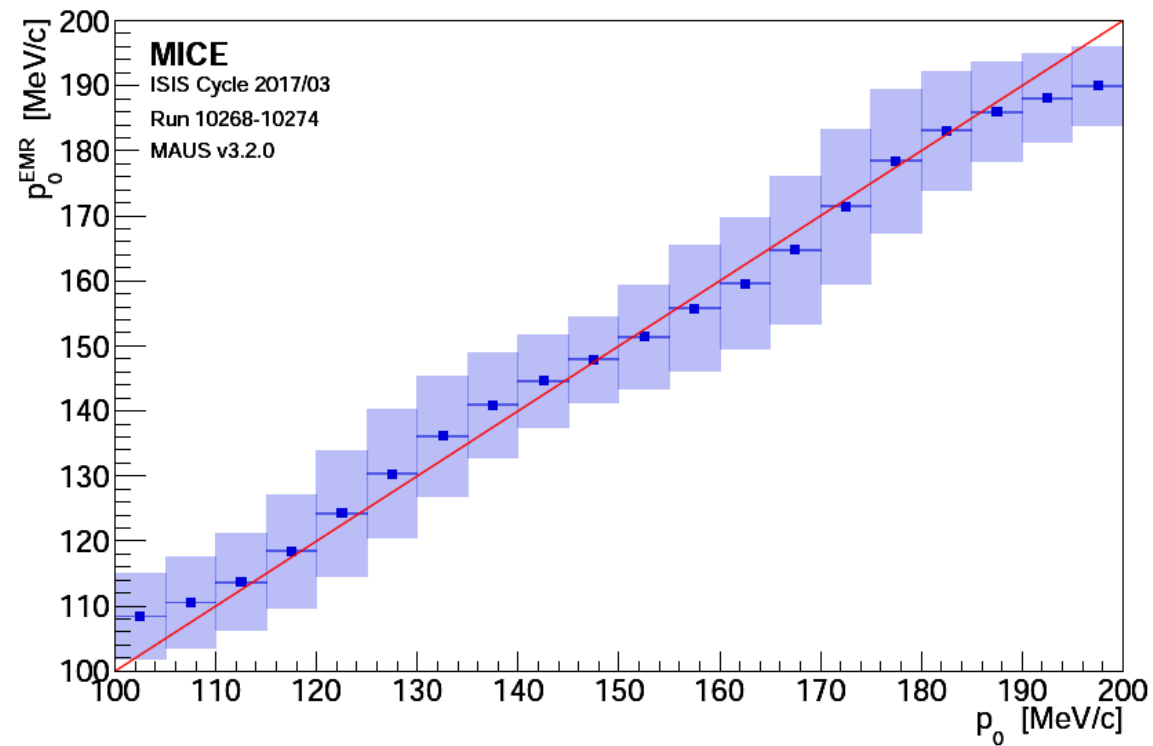
- Range distribution and range vs TOF12



EMR



- Momentum reconstructed from the range (CSDA)





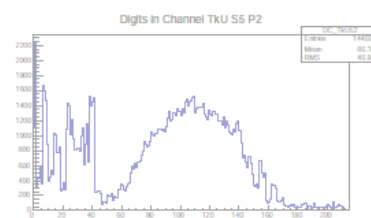
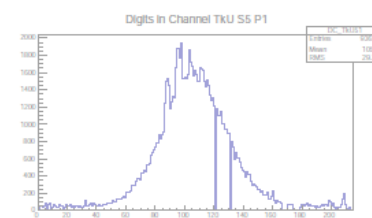
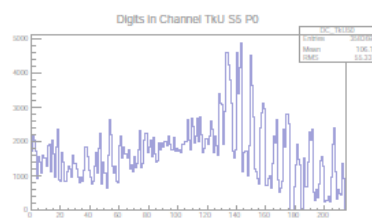
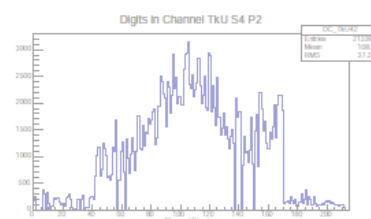
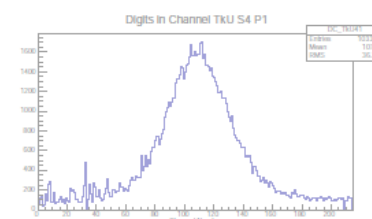
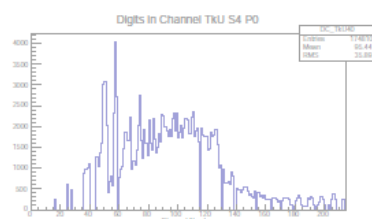
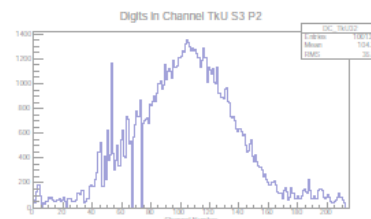
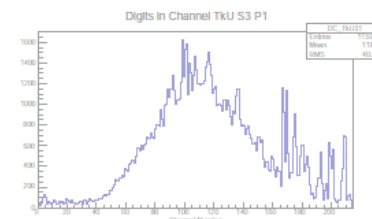
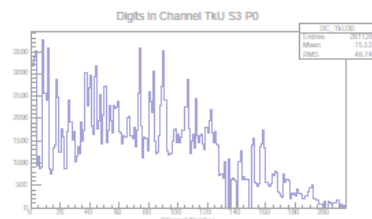
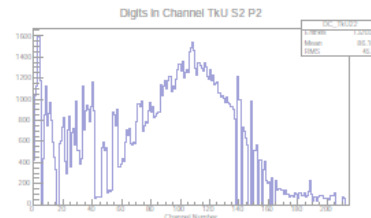
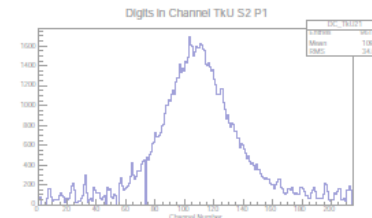
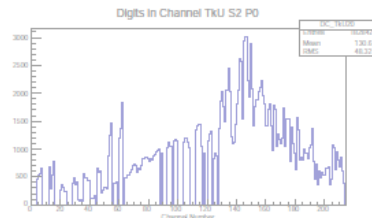
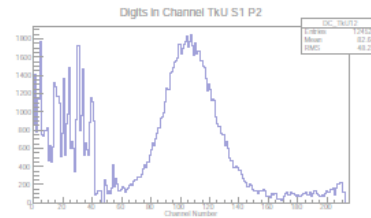
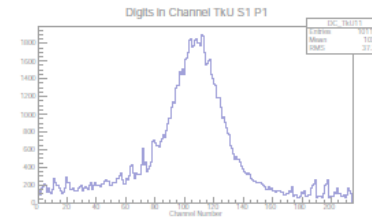
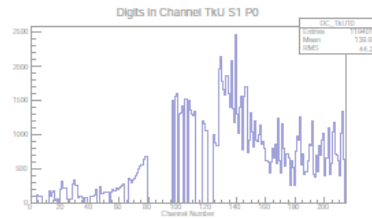
Trackers

- Leave out digit plots
- Revise some other plots (include errors, reconstruction with different fields models, ...)

Trackers

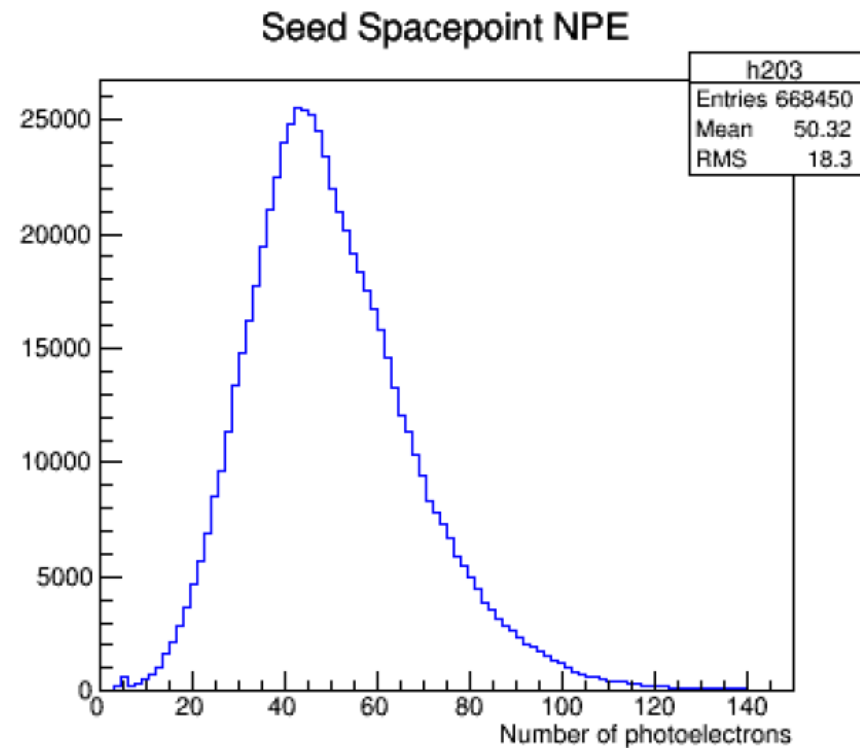
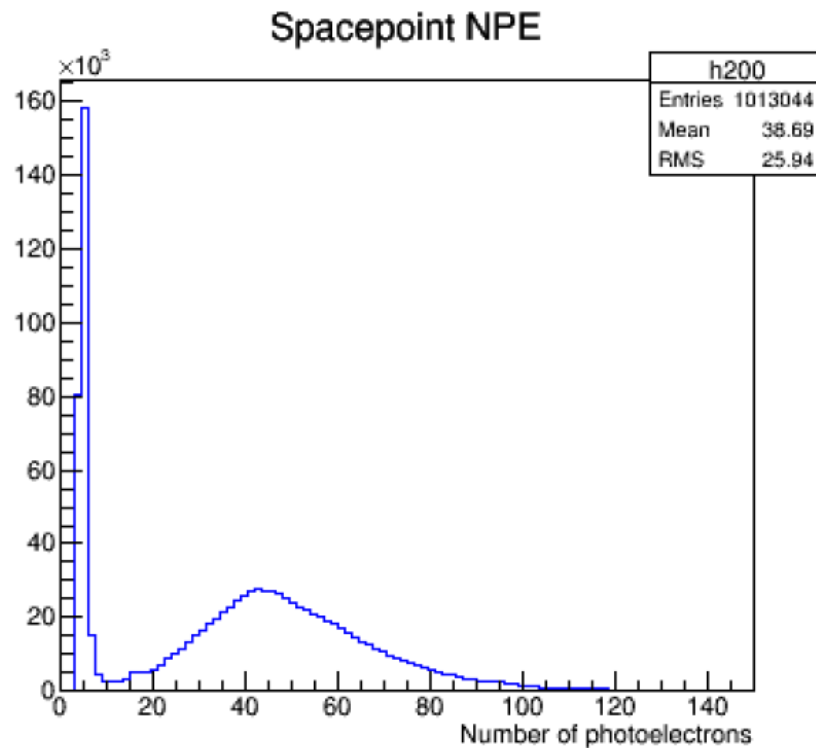


- Digit profiles in TKU



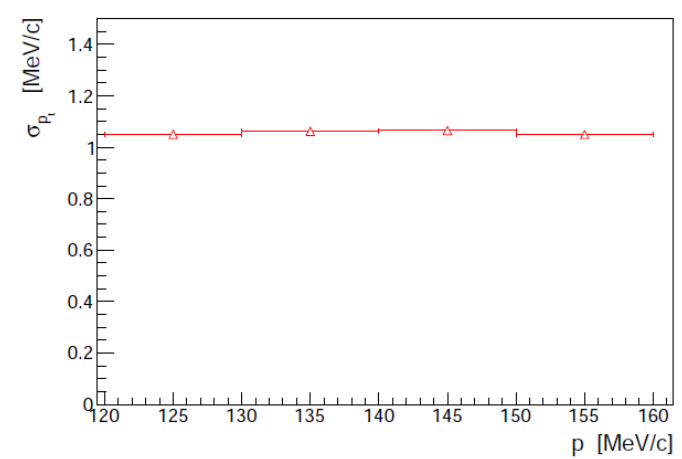
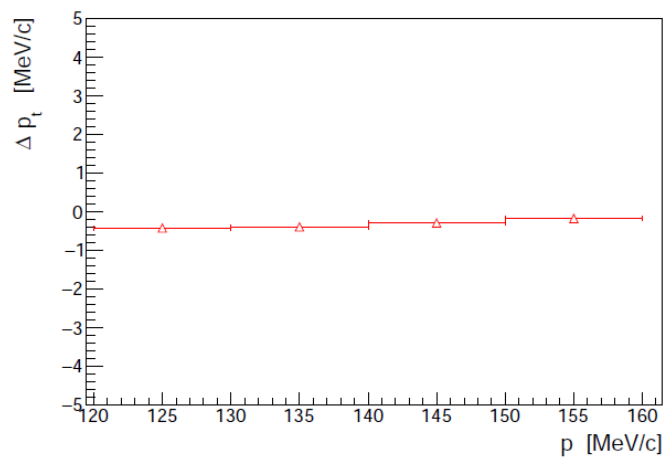
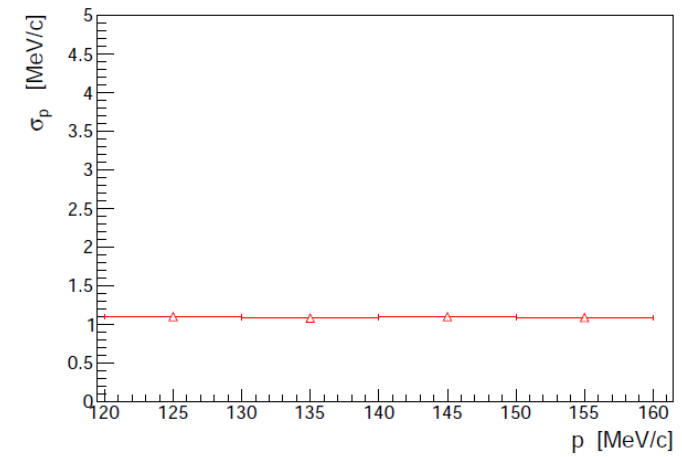
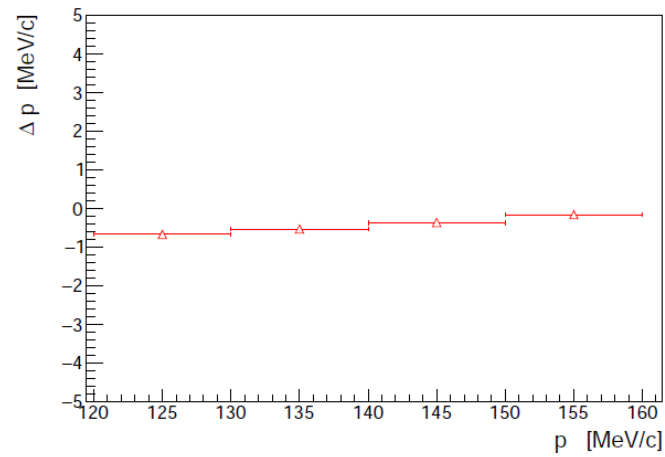
Trackers

- Space points and space points used for tracks

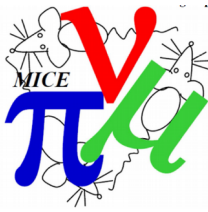


Trackers

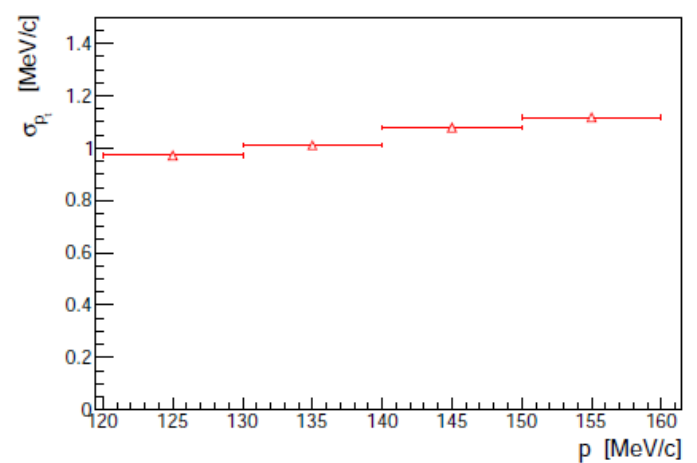
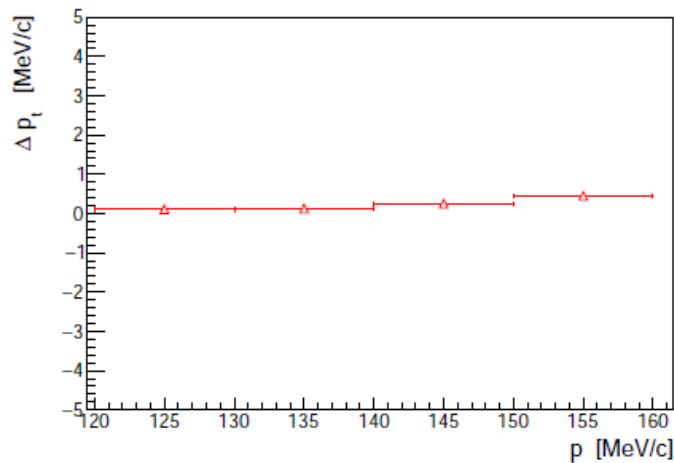
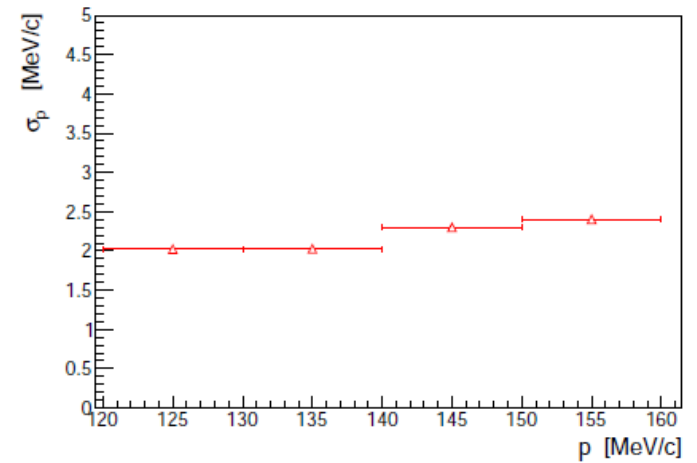
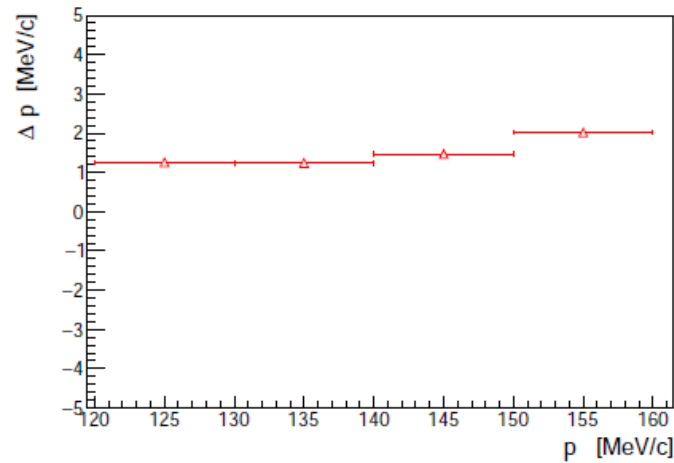
- Momentum reconstruction bias and resolution (TKU)



Trackers



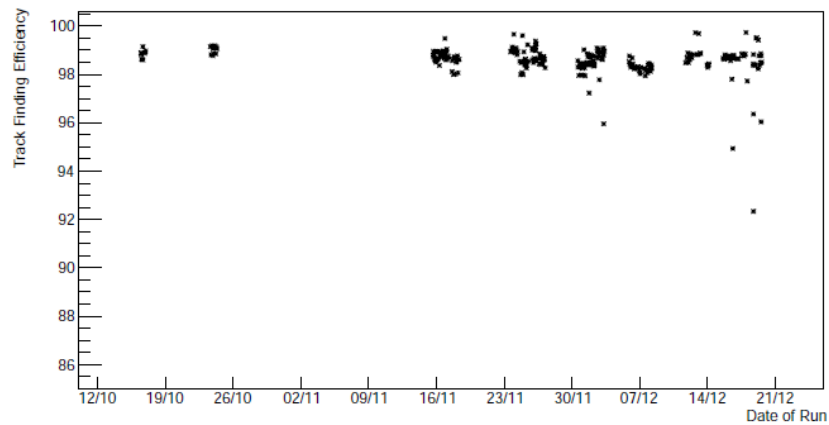
- Momentum reconstruction bias and resolution (TKD)



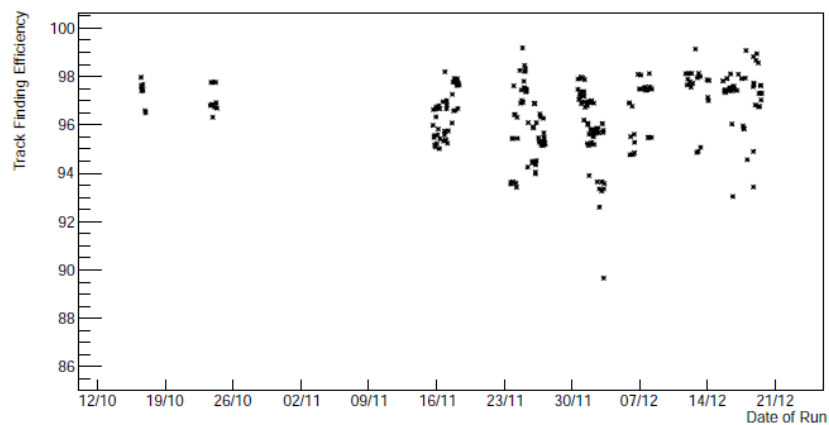
Trackers

- Track finding efficiency (late 2016)

TKU

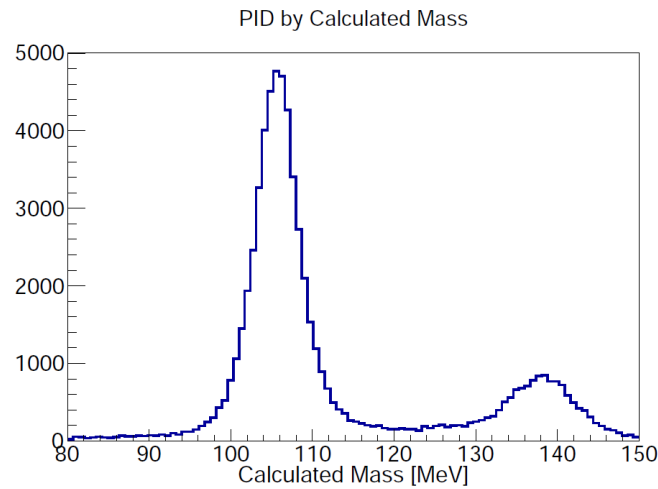
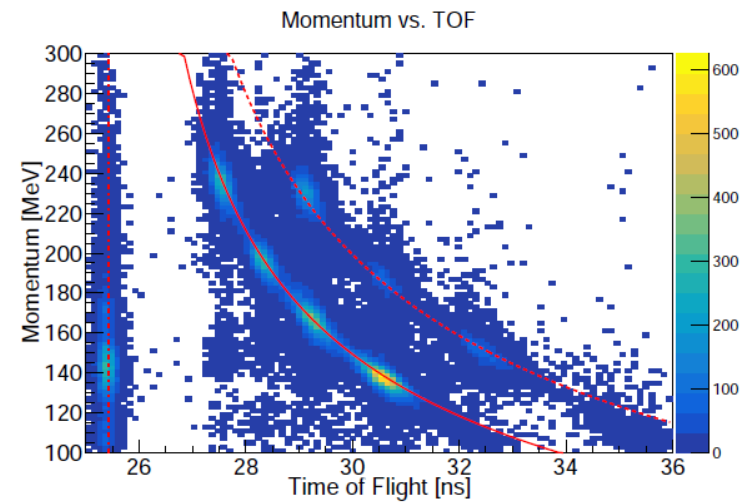
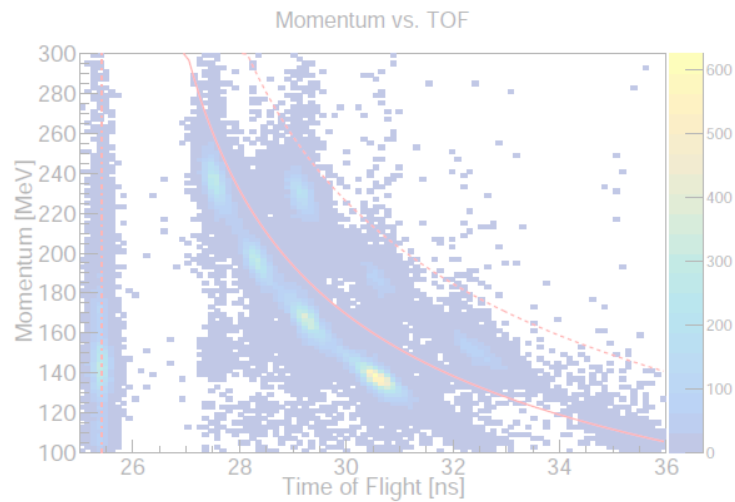


TKD



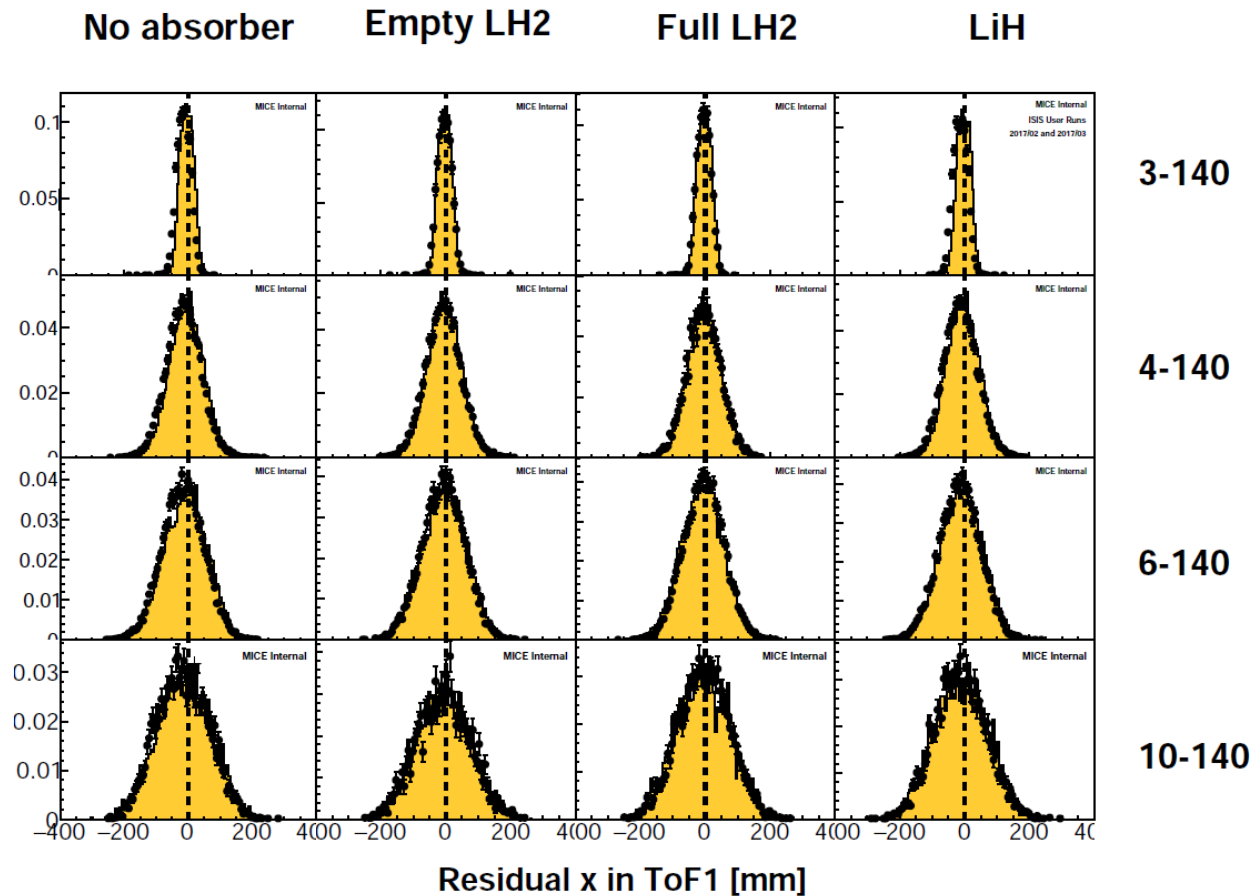
PID

- So far TOF and Tracker PID



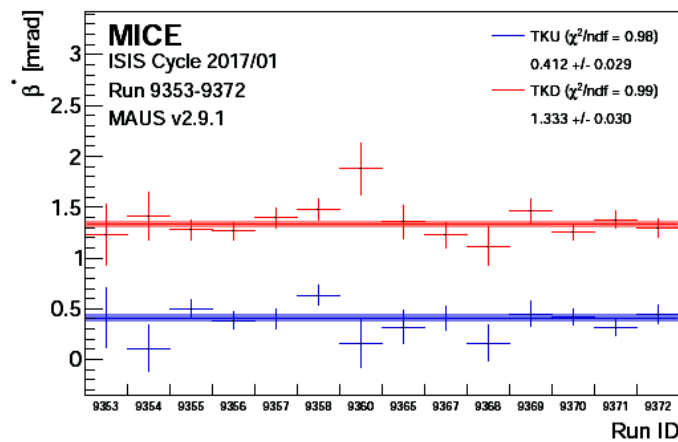
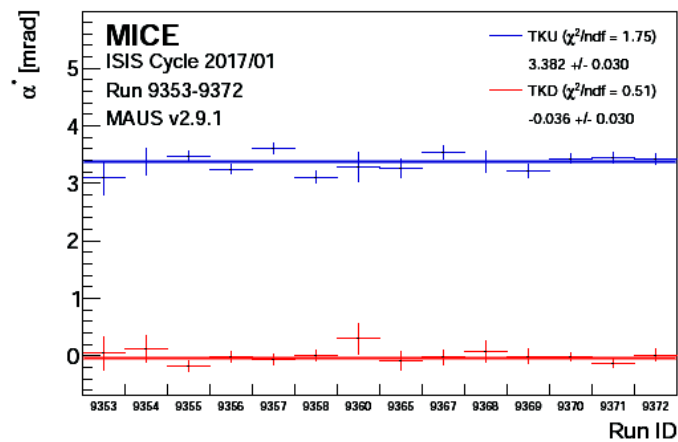
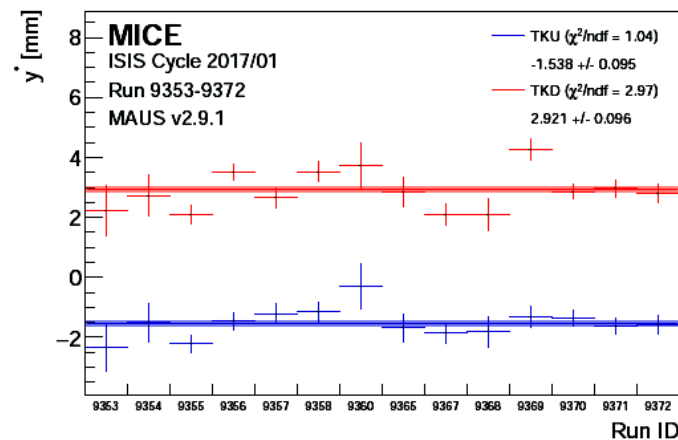
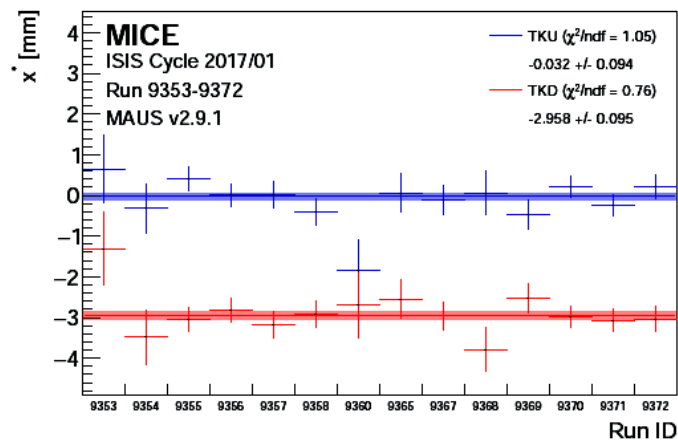
Track matching

- Only few residuals examples



Detectors alignment

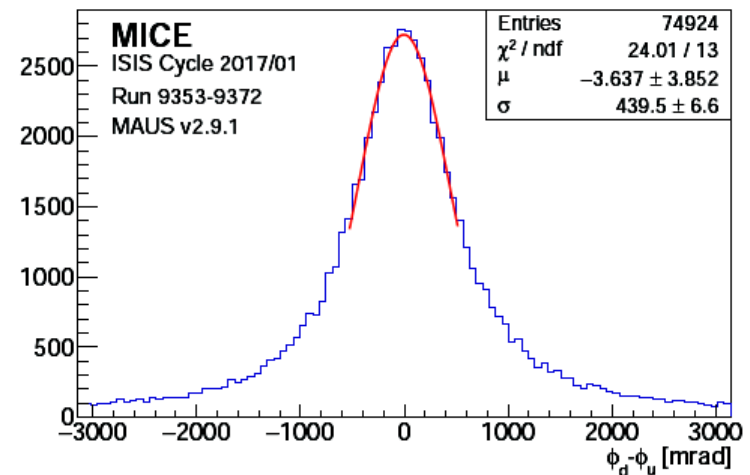
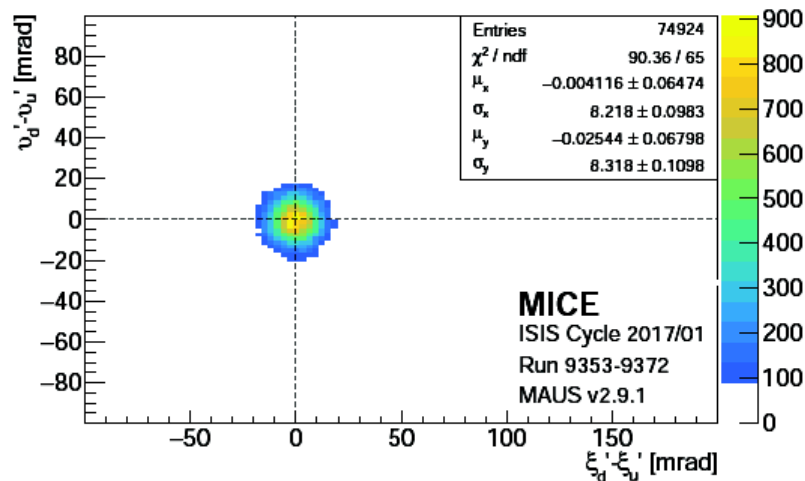
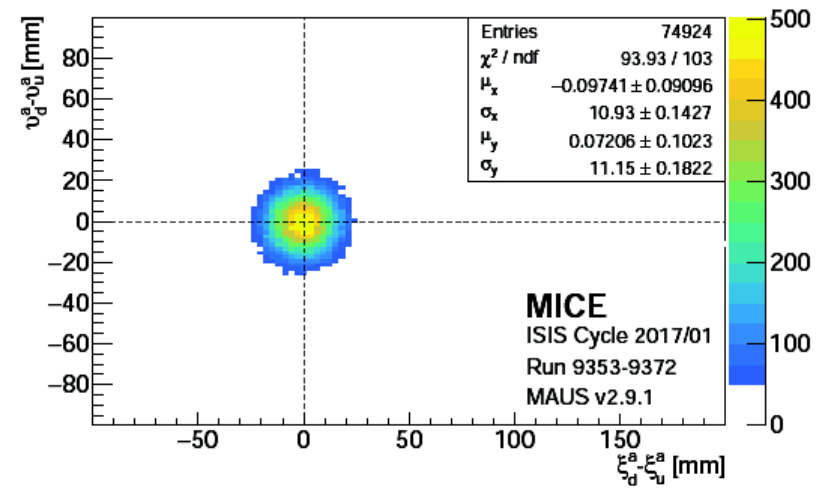
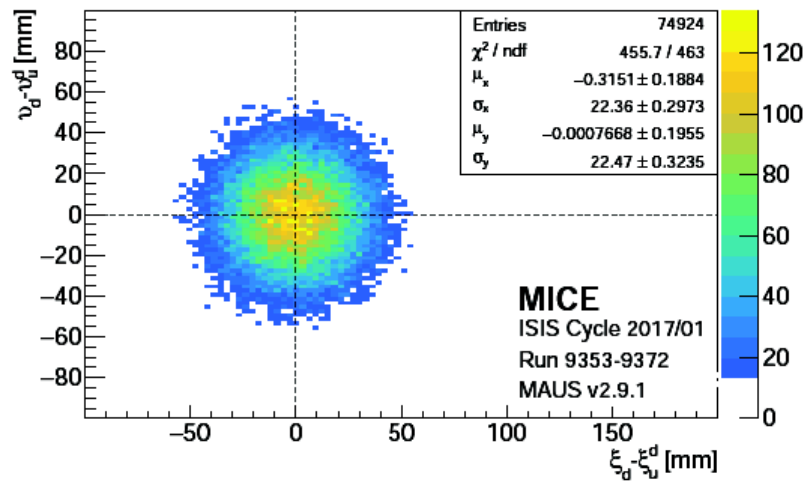
- Alignment constants during 2017/01



Detectors alignment

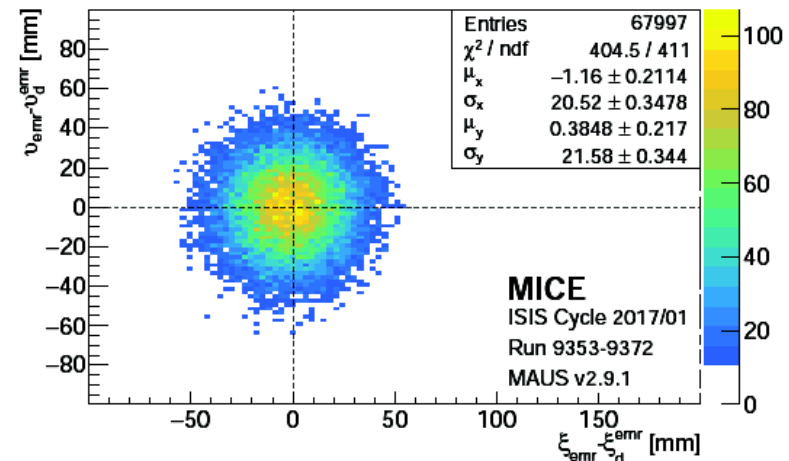
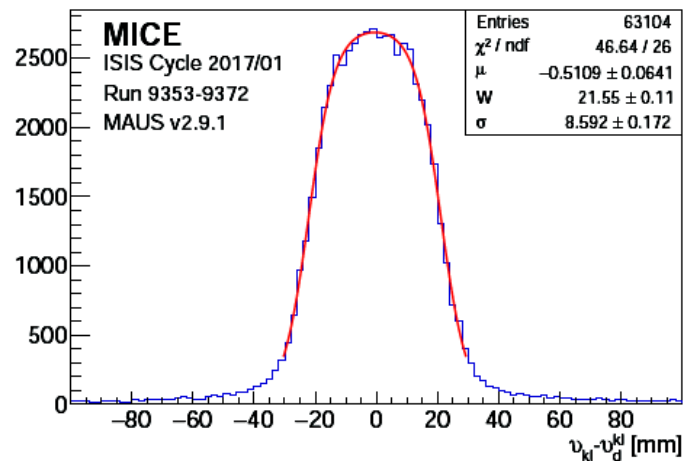
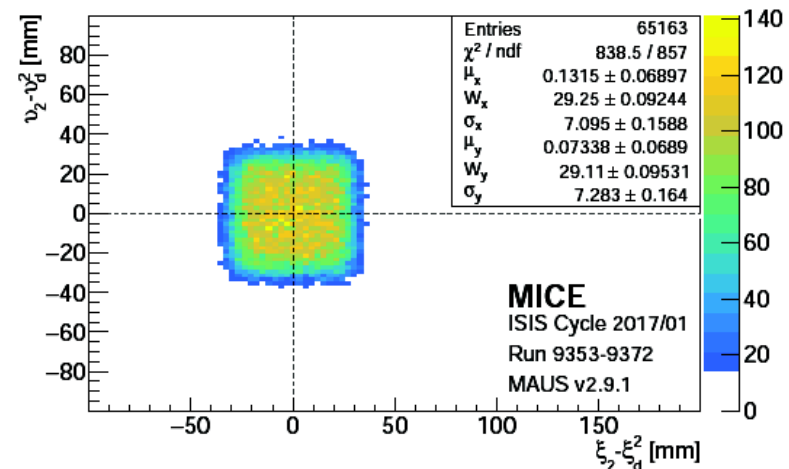
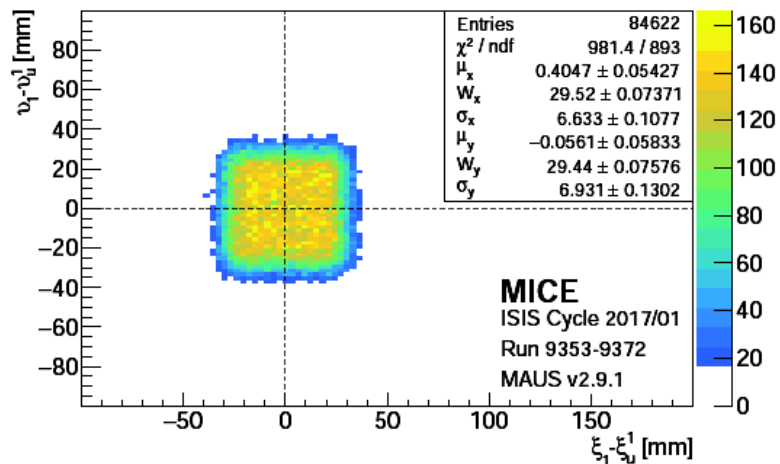


- Residual distributions between trackers



Detectors alignment

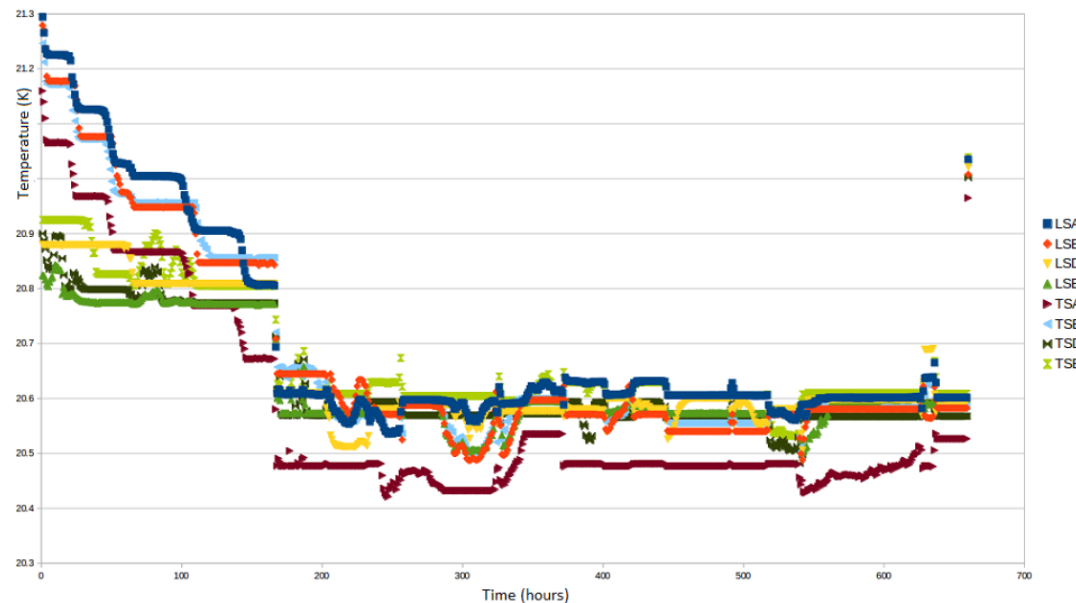
- Tracker to TOF1/2, KL and EMR residuals



Liquid hydrogen

- Only plot: variation of the density → use ROOT for it.

Vessel temp.
sensors after
corrections

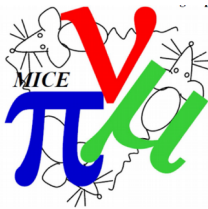


- Contraction of the vessel due to cooling
- Deflection of the vessel due to pressure
- Variation of the windows thickness



To Do

- Have all the analysis to use
 - same MAUS version
 - similar datasets when possible
- Uniform plotting style either for data and MC
- Reduced to ~50 pages... still way to much



Details

- First review of the plots done
- First reading to be done
- Referees: Alan B., Ludovico T.

- Repository: <https://github.com/pfranchini/MICE-systems-performance-paper>
- Few more details:
https://micewww.pp.rl.ac.uk/projects/analysis/wiki/2018-09-18_system_paper