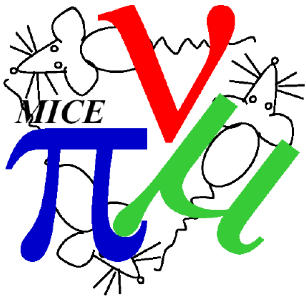


# Field On Scattering

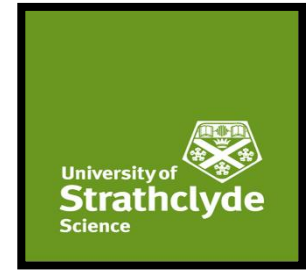
Alan Young

Department of Physics,  
University of Strathclyde

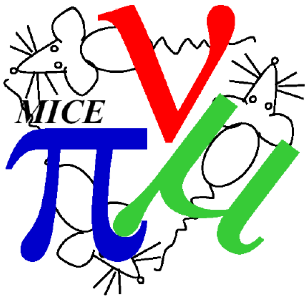
28<sup>th</sup> November 2018



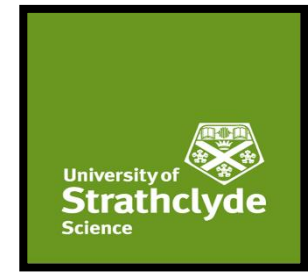
## Code Status



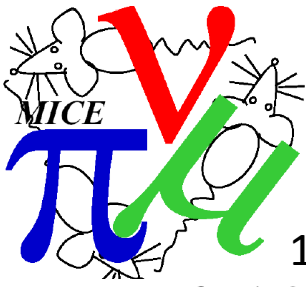
- Analysis carried out using Maus 3.1.0
- Field on analysis code based on Field off code developed by R Bayes and J Nugent.
- Globals implemented in data selection
- Additional cuts added to improve quality of data have been added
- Correction to downstream momentum has been added to compensate for misalignment
- Data preparation, including most cuts and analysis have been split to improve performance
  - Data preparation taking over two days to complete
  - Once data prepared, analysis of each momentum slice taking less than an hour



## Data Selection

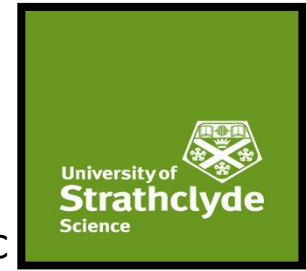


- Require exactly 1 TOF1 space point
- Require exactly 1 TOF0 space point
- Require exactly 1 track in Upstream Tracker
- Upstream tracker  $\text{Chi}^2/\text{dof} < 5$
- Upstream tracker max radius  $< 150\text{mm}$
- Diffuser max radius  $< 100\text{mm}$
- TOF01 consistent with Muon Peak
- Extrapolated TOF01 consistent with muon hypothesis
- Successfully extrude track from Upstream tracker back to TOF0
- Fiducial cut - require the track from the upstream tracker, when projected downstream to be within a specific radius at a point downstream
- Select narrow range of muon momentum to allow study of scattering as a function of momentum



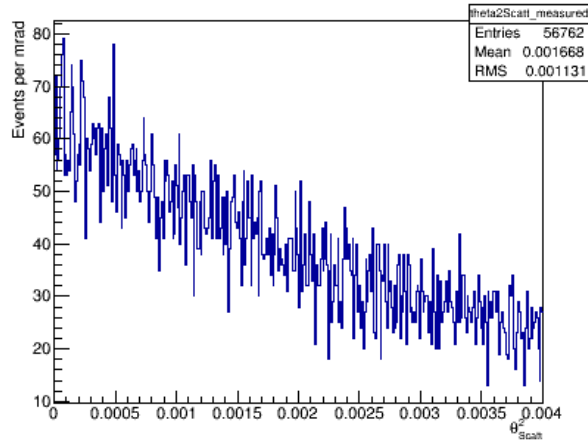
140MeV/c

# Measured Scattering Angles



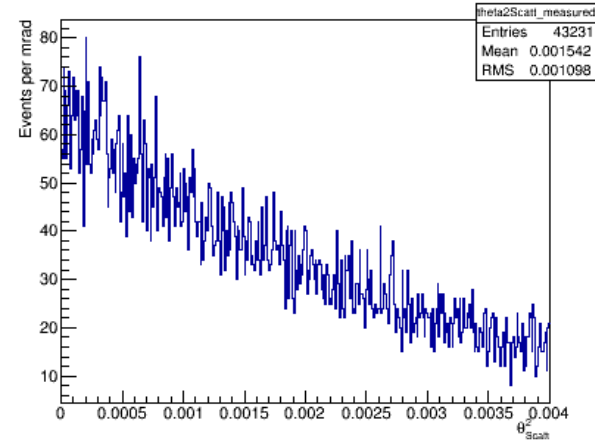
170MeV/c

Scattering Angle between Momentum Vectors



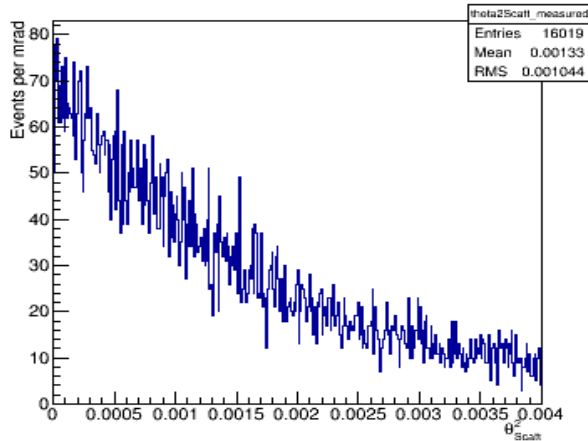
200MeV/c

Scattering Angle between Momentum Vectors

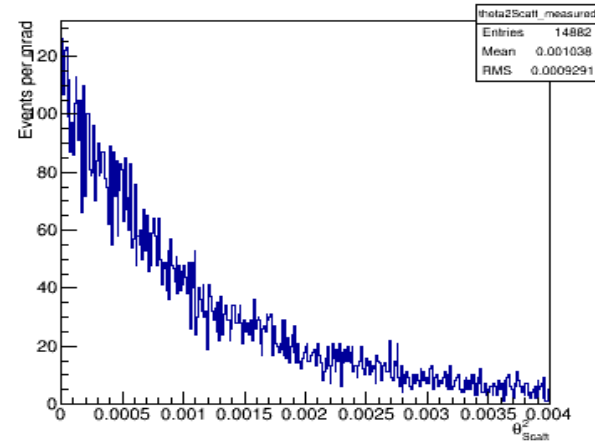


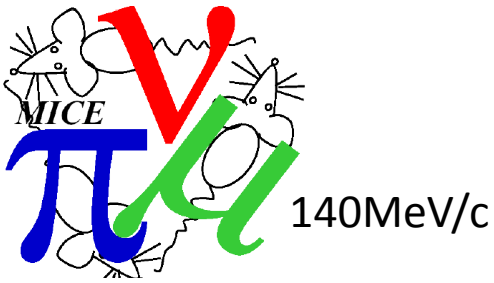
240MeV/c

Scattering Angle between Momentum Vectors

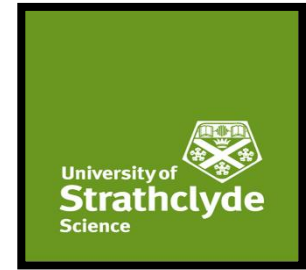


Scattering Angle between Momentum Vectors



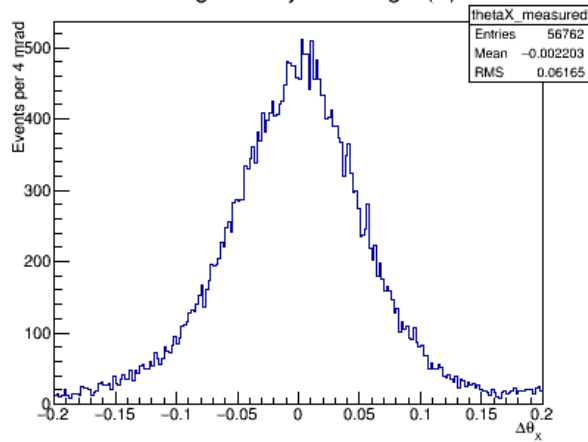


# Measured Scattering Angles



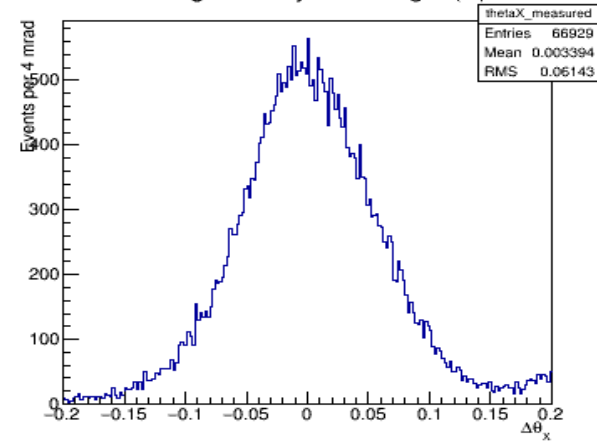
170MeV/c

Change in Projected Angle (X)



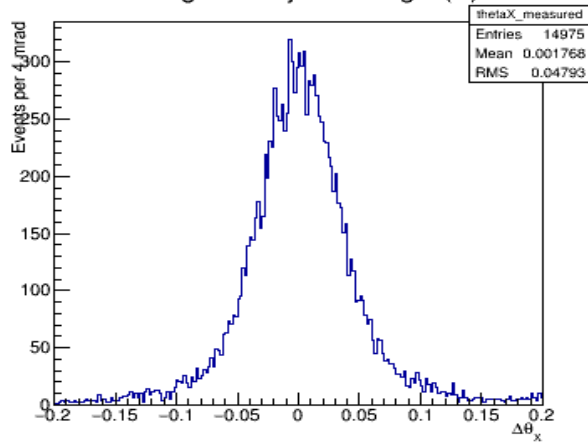
200MeV/c

Change in Projected Angle (X)

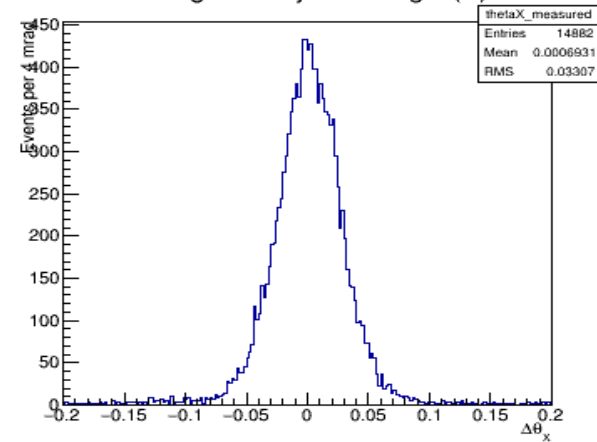


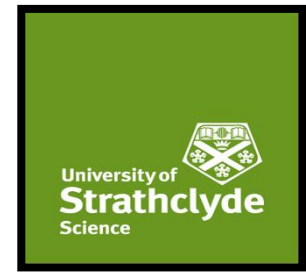
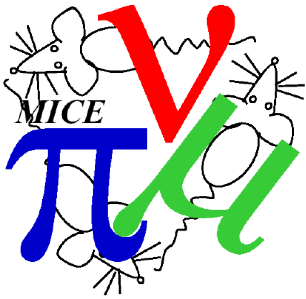
240MeV/c

Change in Projected Angle (X)



Change in Projected Angle (X)





## Summary

- Seeing an unexpected asymmetry in the projected scattering angle
  - Introduced a correction factor to compensate
- Starting to run analysis code over full data set, but it is slow.
  - Most of the time is taken in preparing the data for analysis, which includes data selection.
  - Looking to introduce a 2-stage process, where most computational intensive part of data preparation process is run separately from momentum selection and analysis

## Future Work

- Full analysis will require access to grid computing resource, which is currently being pursued
- Control scripts for error analysis to be prepared.