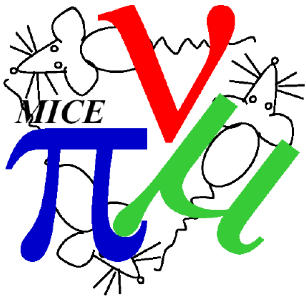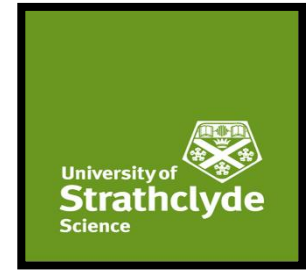# Field On Scattering

Alan Young

Department of Physics,
University of Strathclyde

22nd February 2019

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
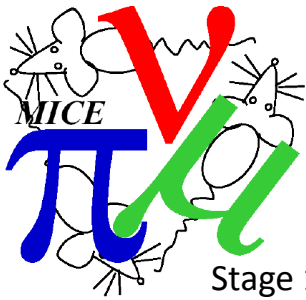
Data Selection
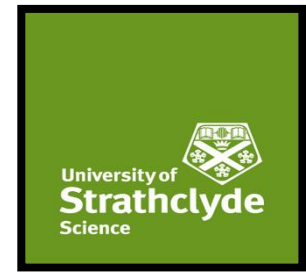
Stage 1 – Preliminary stage where data is prepared for analysis
- Stage 1a - Data read from root file and following cuts applied.
    - Require exactly 1 TOF1 space point
    - Require exactly 1 TOF0 space point
    - Require exactly 1 track in Upstream Tracker
    - Upstream tracker Chi2/dof<10

- Stage 1b - Properties of particles that pass the above cuts are determined at key axial positions that are used in the next stage of cuts. If available this is taken from Globals, otherwise calculated using globals::propagate.
    - Upstream tracker max radius < 150mm
    - Diffuser max radius < 100mm
    - TOF01 consistent with Muon Peak
    - Extrapolated TOF01 consistent with muon hypothesis
    - Successfully extrude track from Upstream tracker back to TOF0
- Properties of Muon at centre of absorber as predicted by upstream and downstream trackers and at end of DS tracker are saved.

Stage 2 – Main analysis stage where final cuts are made and scattering analysis code run
    - Fiducial cut - require the track from the upstream tracker, when projected downstream to be within 140mm radius at station 5 of downstream tracker
    - Select narrow range of muon momentum to allow study of scattering as a function of momentum
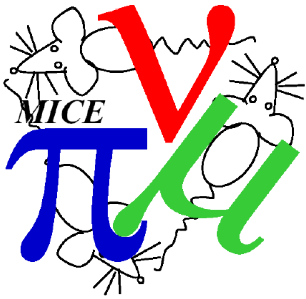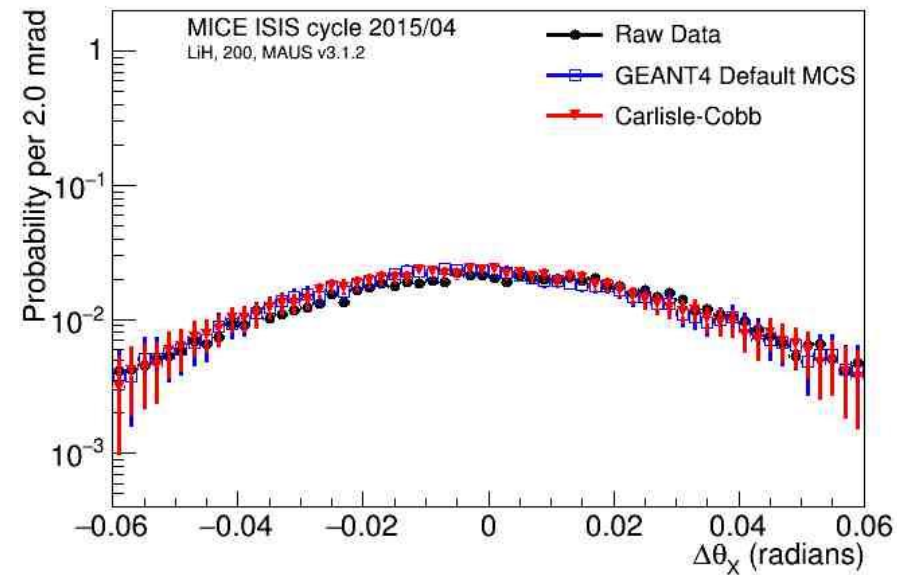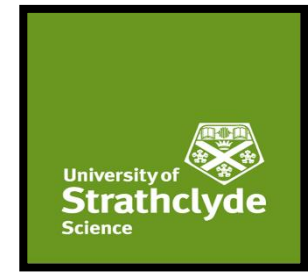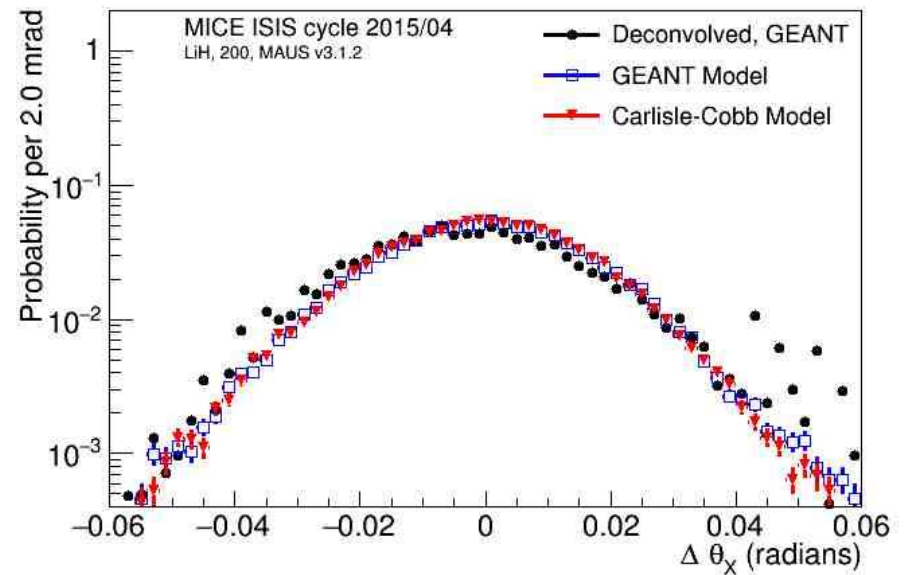
Control Scripts
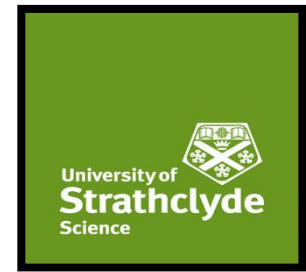
- Control Scripts to study systematic errors for Field On analysis being prepared
  - Fiducial error control script completed
- Script to generate scattering curves has been modified for Field On Analysis
- Further work on control scripts continued after analysis of Monte Carlo Data

Raw Data vs empty channel convolved with scattering models
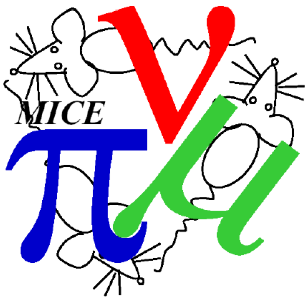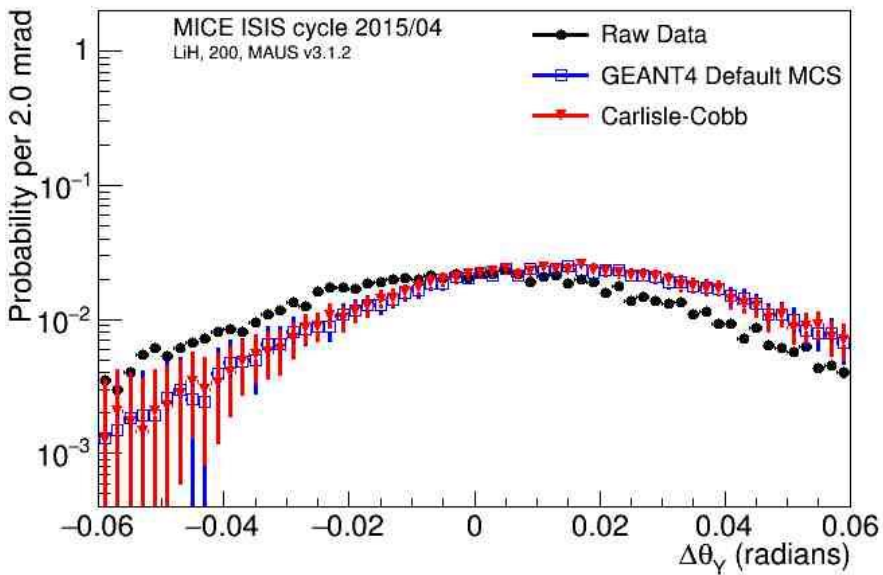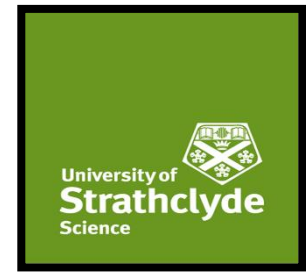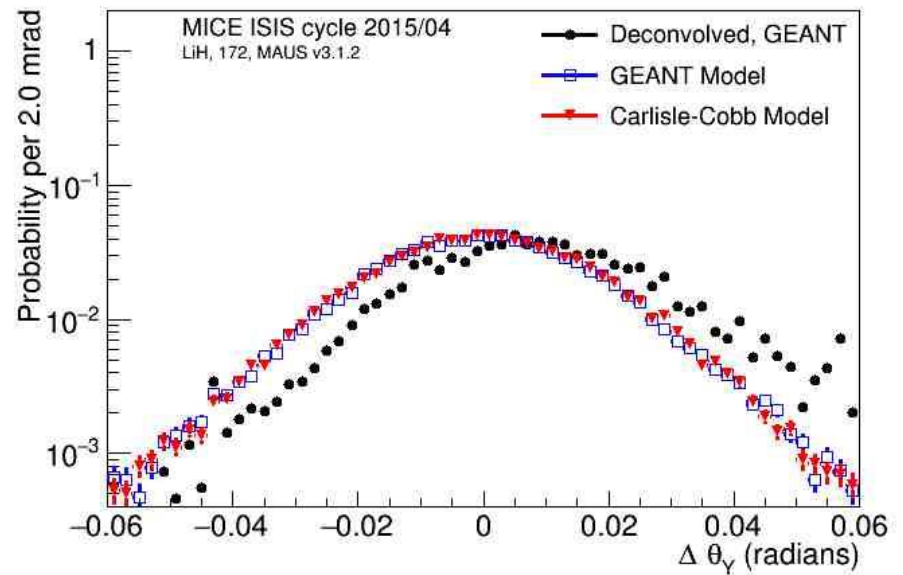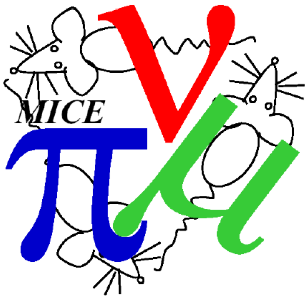

Deconvolved data vs Scattering models
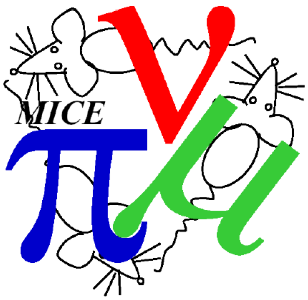
Preliminary Scattering Results

Raw Data vs empty channel convolved with scattering models
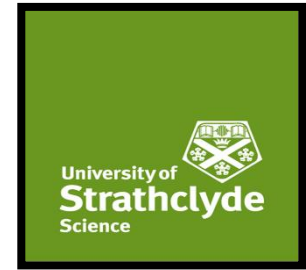

Deconvolved data vs Scattering models

Field On Scattering

Summary

- Starting to run analysis code over full data set, but it is slow
    - Introduced a 2-stage process, where most computational intensive part of data preparation process is run separately from momentum selection and analysis
- Preliminary scattering curves have been produced

Current Work

- Test analysis using Monte Carlo data
- Control scripts for error analysis being prepared
    - Control scripts for field off analysis already available
    - Adapting these scripts to work with 2-stage field on analysis
- Full analysis will require access to grid computing resource, which is currently being pursued
    - Grid certificate obtained
    - Can connect to MICE VO
    - Need to devise a method to submit jobs
    - Possibility raised of using PPD cluster