BabyMIND Software Presentation

Collaboration meeting: SaRoMaN software

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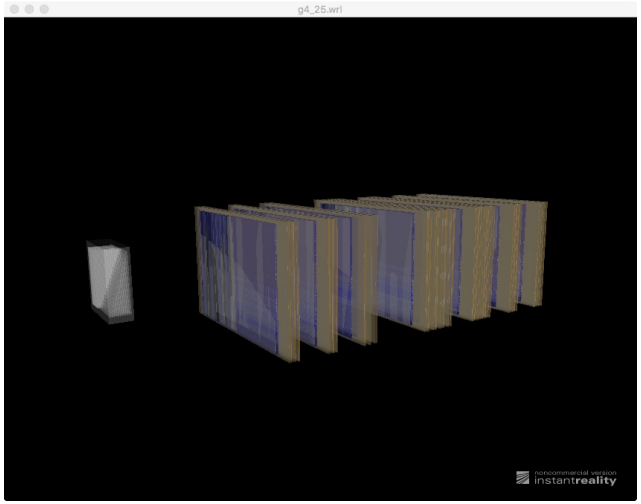
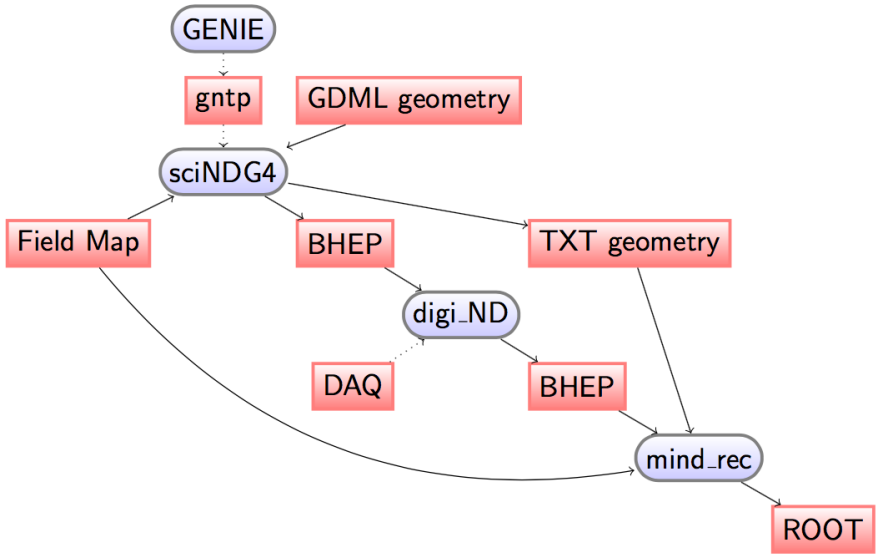


Introduction

- The software environment used for Baby MIND is the SaRoMaN software suite.
- Simulation and Reconstruction of Muons and Neutrinos
- A comprehensive software for MIND/nuSTORM (neutrinos from STORed Muons) .
- Developed at the University of Glasgow over several iterations.



Current status

- Simulations handle single lepton beams.
- Mixed beam produced as a mixed simulation.
- Neutrinos are modelled through GENIE.
- Using Geant4 gdml parser in the whole code.

- Digitisation handles DAQ files as well as simulation.
- Uses splitting of files and unpacking software.
- Reconstruction handles muon tracks from beam or neutrinos.
- Requires a TASD for vertex detection.

Support structure

Jenkins

- Continuously runs test for us.
- Can we still install third party software.
- Does the code still build.
- Will be expanded with more in depth Algorithm tests.
- Can we reconstruct said track.

Versioning

- Using GitLab hosted at Glasgow.
- Secure access via login.
- Would be good if all collaboration code could be stored centrally and version controlled.
- Facilitates the testing.

Metrics for evaluation

Fitted

- Number of tracks that can be used by the software.
- When appropriate, the number of tracks that can be used by RecPack.
- Compared to number of simulated tracks.

Charge ID

- Number of fitted tracks with correct charge.
- Compared to simulated or known charge.

Momentum

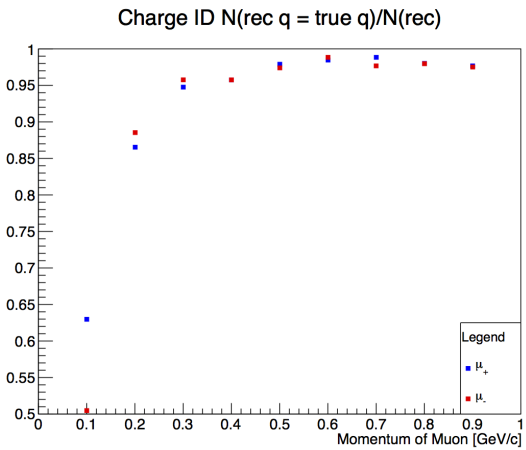
- Reconstructed momentum value.
- Can only be done for fitted tracks.
- Only relevant for fitted tracks.
- Compared to simulated or known momentum.

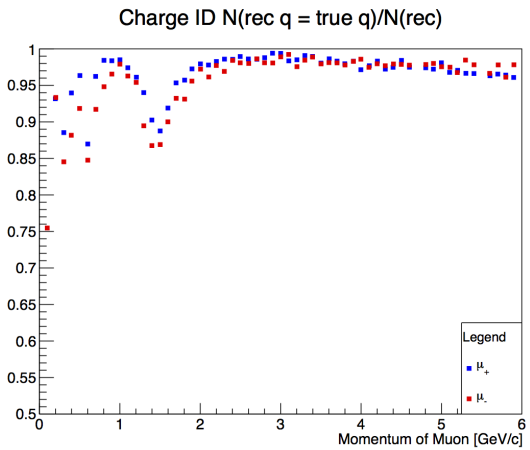
Performed studies

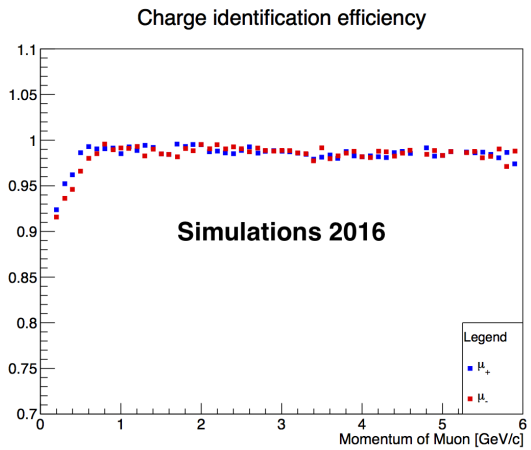
- Charge ID and momentum in only MIND (Different layouts).
- Electronics test beam tracks
- Different MIND layouts.
- Lever-arm thickness
- Charge ID and momentum for MIND + TASD.
- Second test beam Charge ID and momentum for MIND + 2 AiDA veto planes.

Initial work with charge ID

Quarter 1-2, 2016

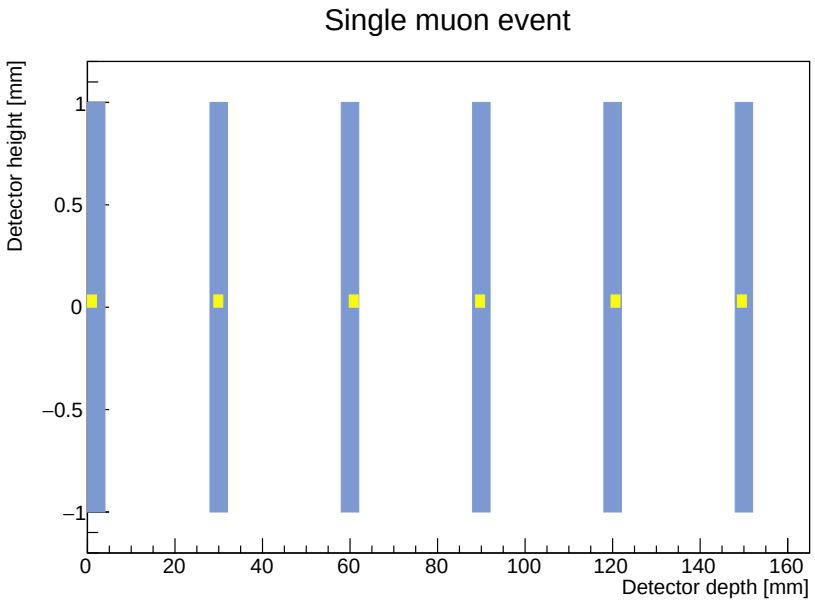


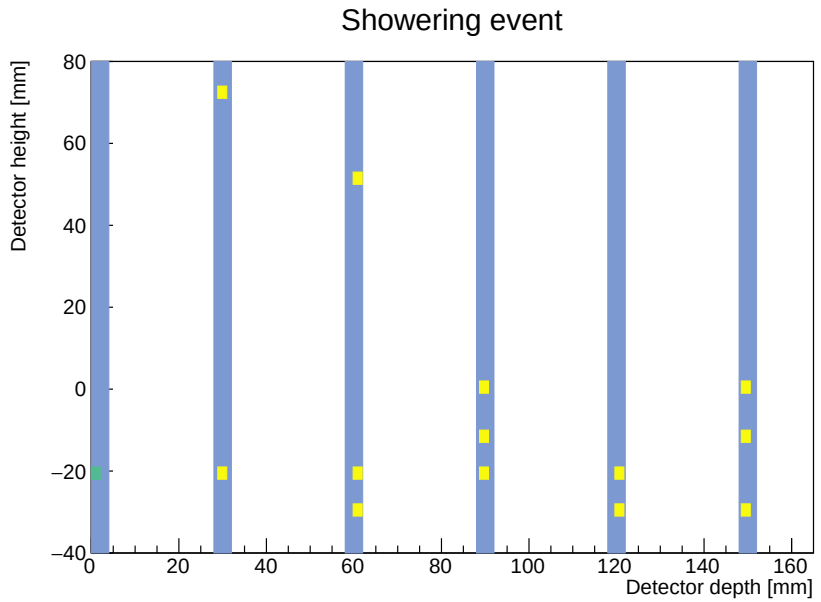




Electronic test beam

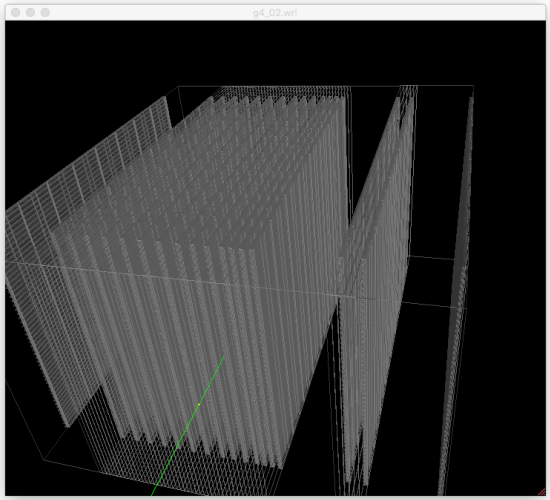
July-August and later, 2016.

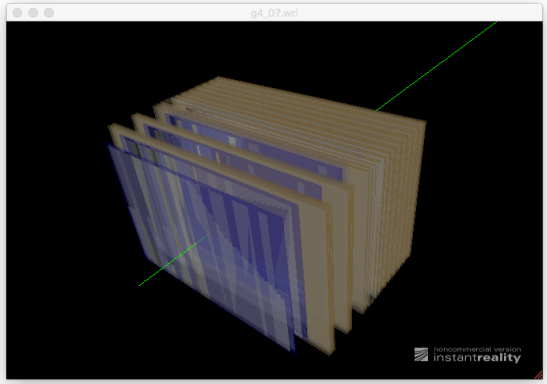


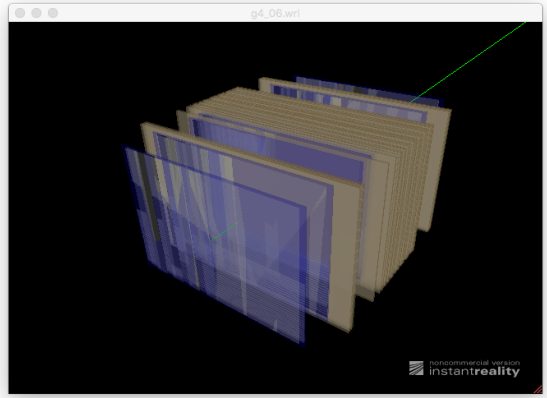


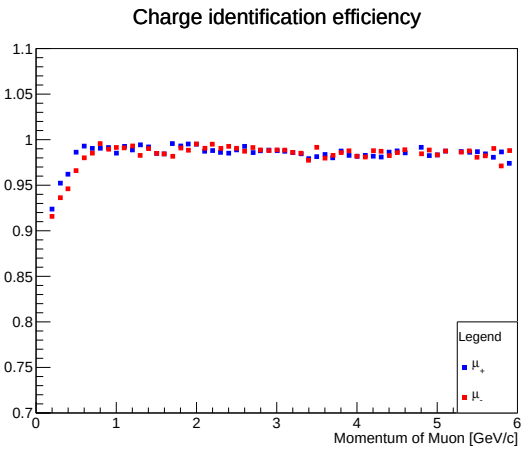
Geometry analysis

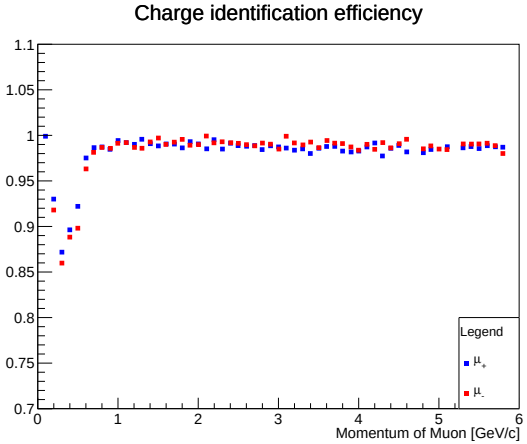
24 August 2016

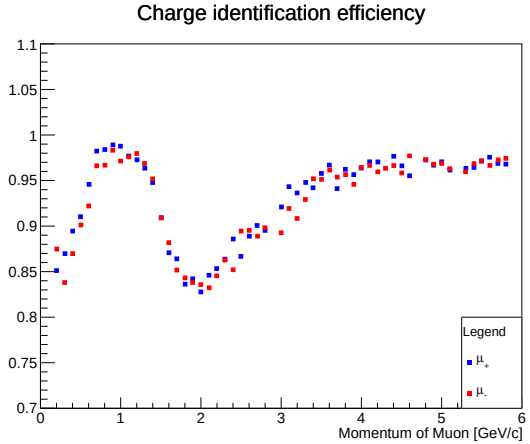






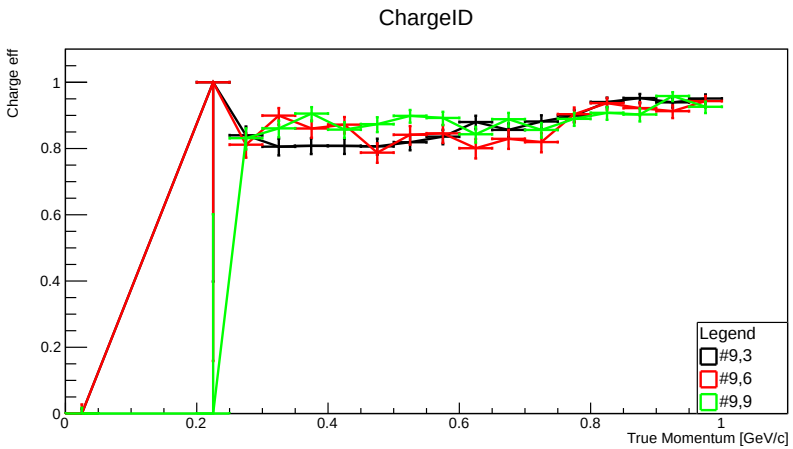


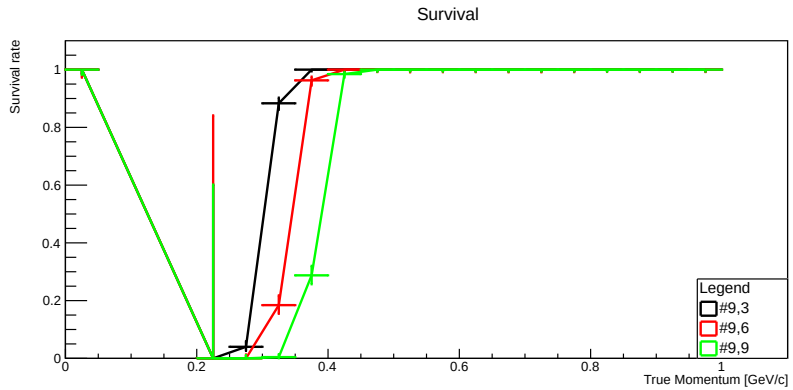


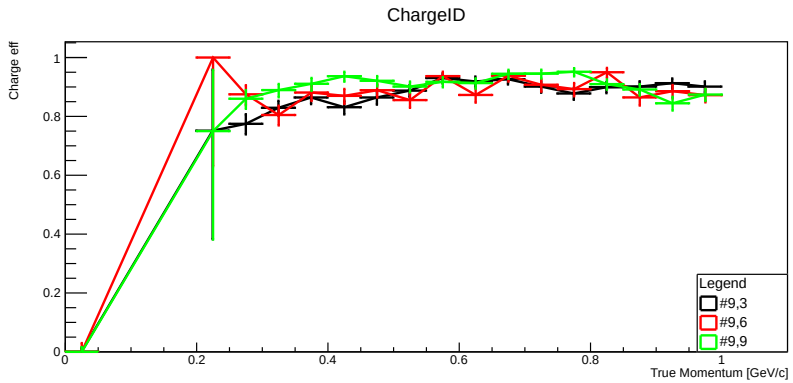


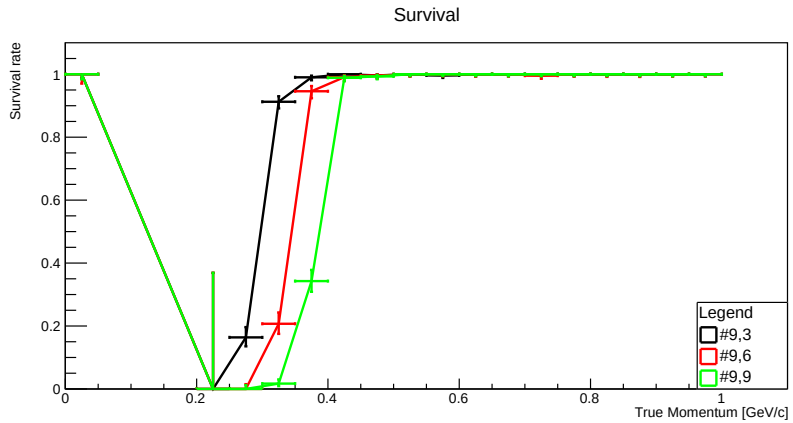
Lever-arm thickness

Initial presentation 14 October, final 21 December 2016



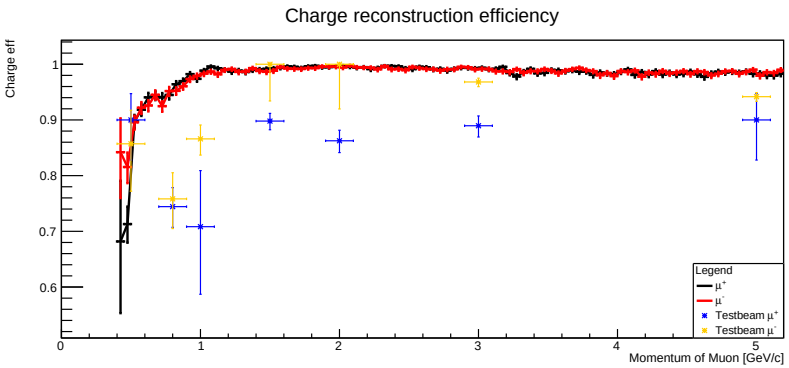


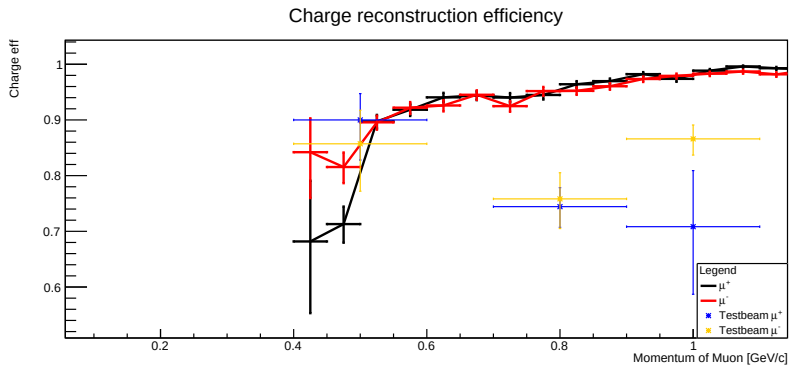




Latest chargeID from test beam

August-October, 2017.





Publications

Posters/talks

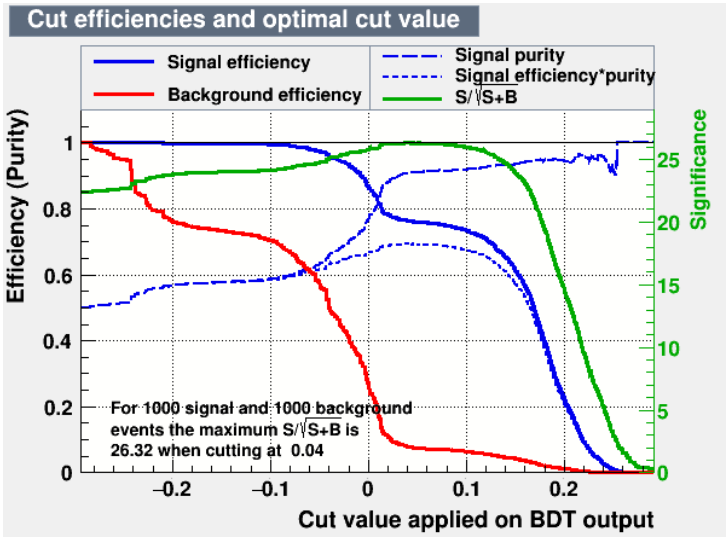
- NuFact16
- NuPhys16
- NuFact17

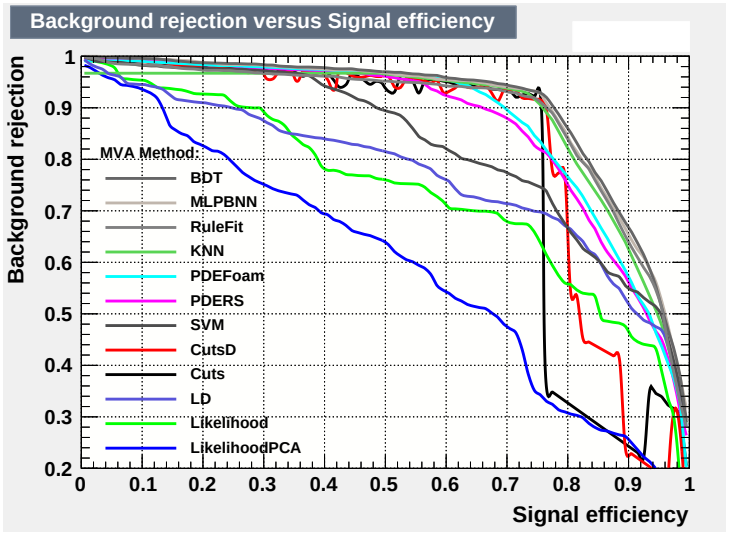
Potential papers

- Testbeam
- Software
- Estimated performance

Ongoing studies

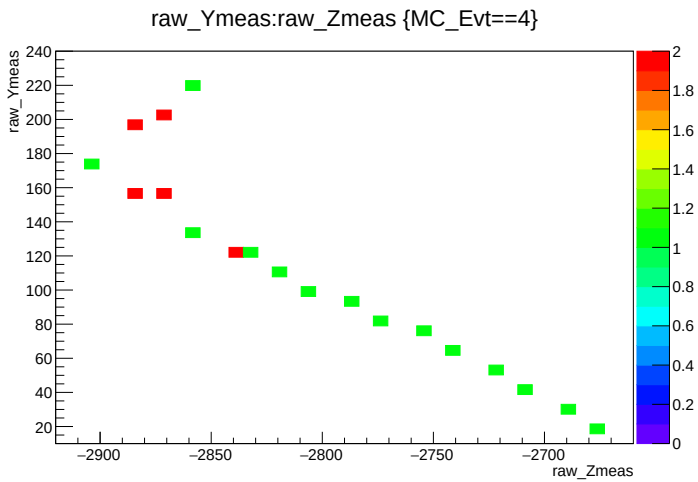
- PID with a TMVA (Machine learning)

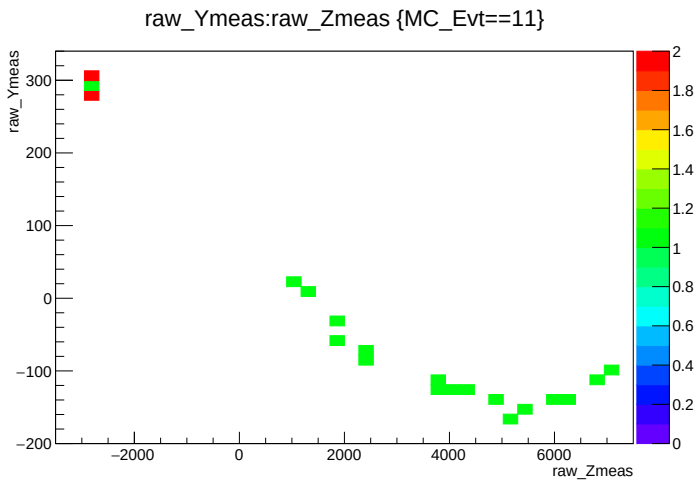




Ongoing studies

- ν_μ CCQE in TASD+MIND
- Writing up thesis





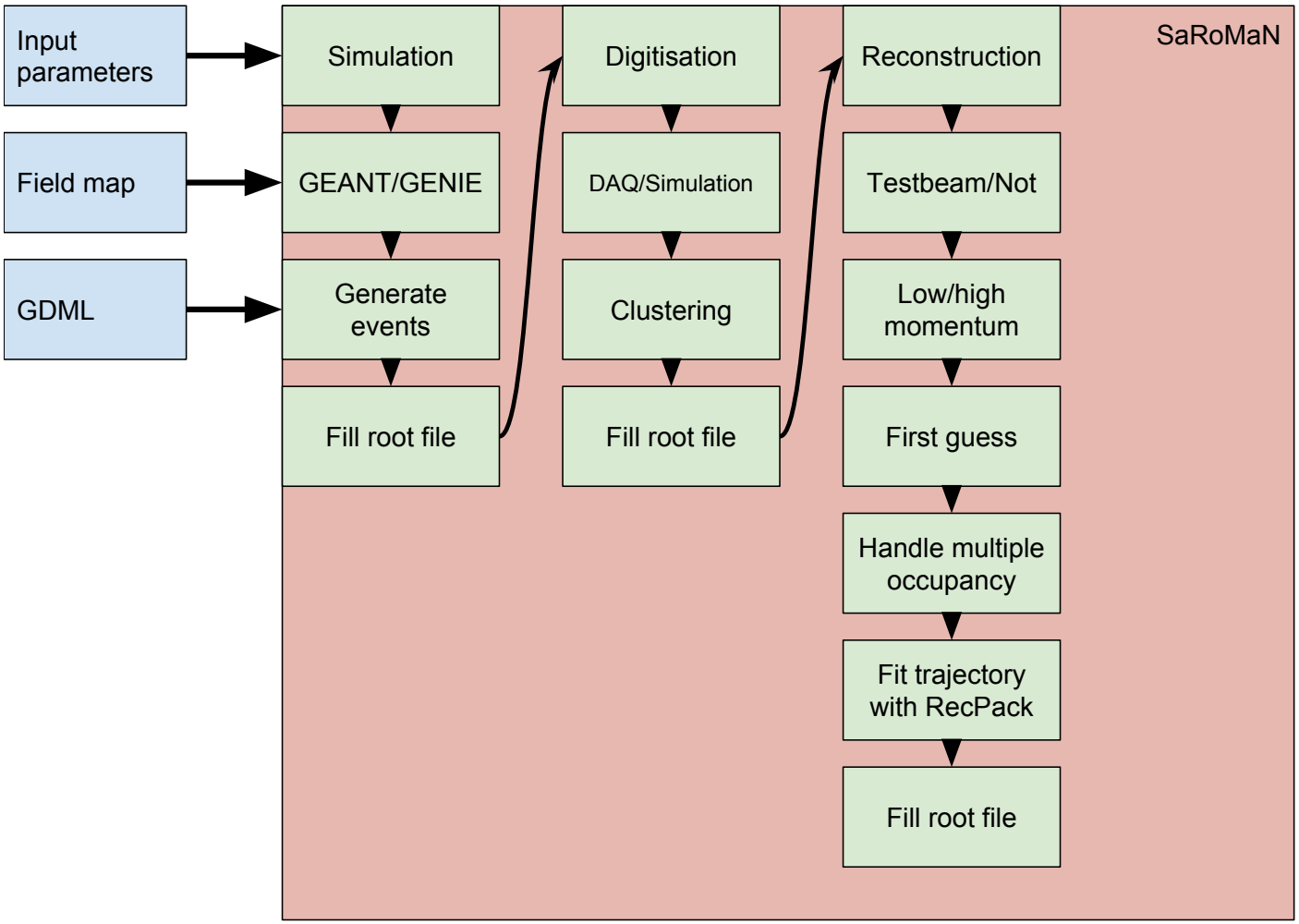
Future

- More test beam data analysis, when accessible.
- Full beamline simulations.

Any questions?

Backup

SaRoMaN software structure



SaRoMaN software structure

- Python wrapper.
- Geometry in GDML file
- Field in file.
- SaRoMaN produces 3 different config files for each part.
- Simulation, genie or geant4.
- Creates a root file with simulated events.
- Digitisation, can handle daq files, require xml/sql to convert hits to real positions.

- Digitisation creates a root file with the digitised events.
- Reconstruction, estimate momentum and charge to use recPack.

Near detector studies