

MINOS+ Beam Fits Overview

Anna Holin
University College London

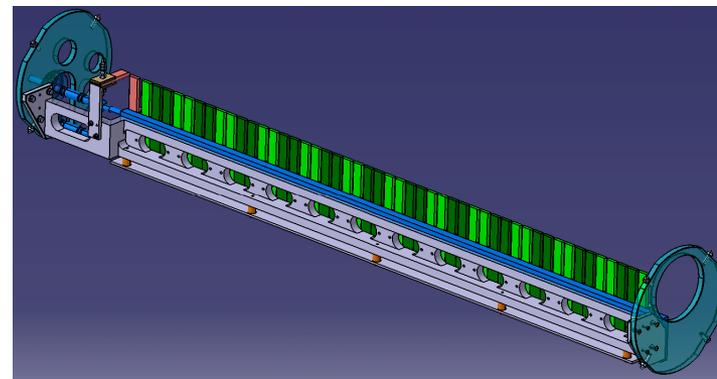
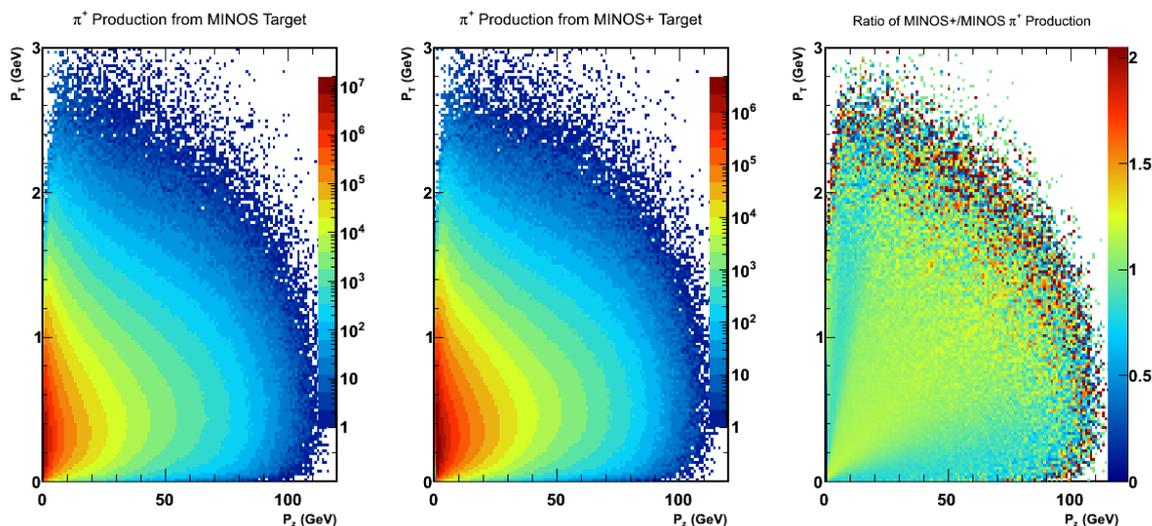
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Introduction

We have a new target and new medium energy data, both horn on and off.

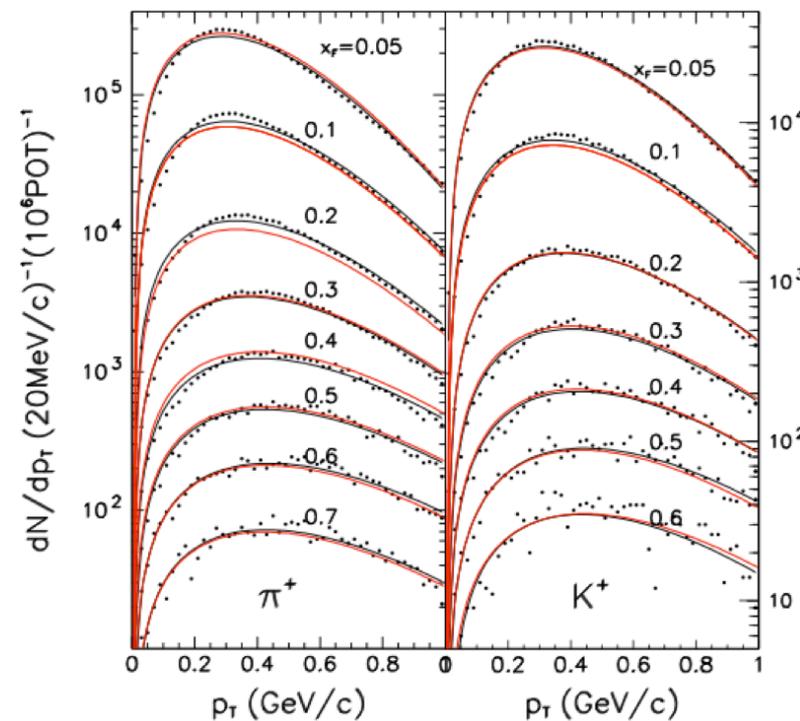
We need new beam fits for MINOS+:

- New MINOS+ parametrisation – Maciek
- New MINOS+ summary files – Ioana
- Do various needed code changes and guidance – Anna
- Flux systematics (except hadron production systematic) - Adam
- Running the fits – Ioana, Maciek, Anna



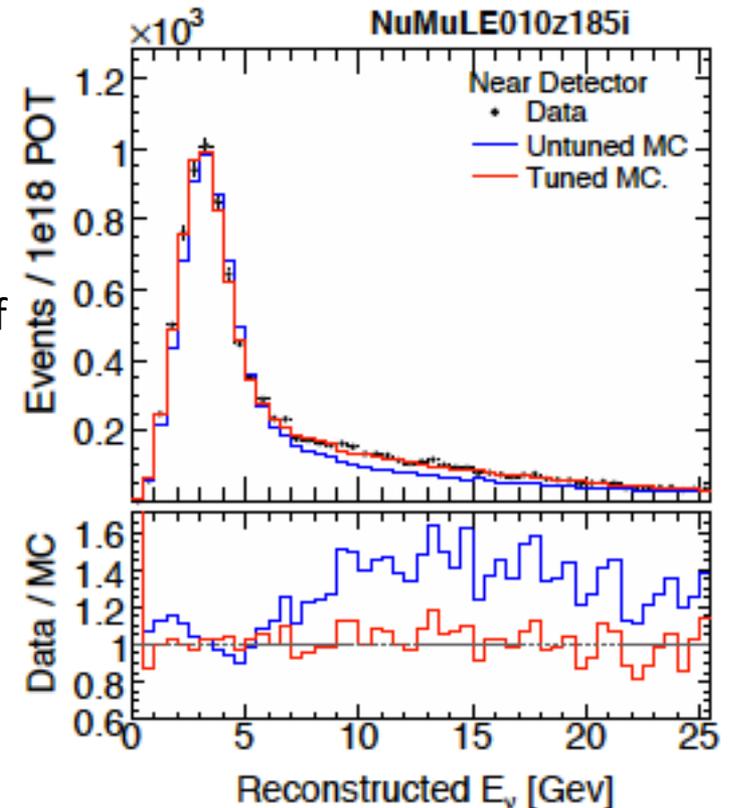
Hadron Production (BMPT) Parametrisation – Maciek

- Maciek prepared new MINOS+ parametrisation(s)
- Initially, when he tried to reconstruct the old MINOS parametrisation for “archeological” purposes, it was very hard to get the fit to look like the original fit (shown here =>)
- He then managed and we decided to try 2 different MINOS+ parametrisations
 - One that uses the same starting settings as the reconstructed original fit (same relative errors, same boundary cuts...)
 - One that is just the best fit to the Flugg MC MINOS+ hadron production
- So we have two MINOS+ parametrisations to play with
- Maciek will explain more about the parametrisations in his talk



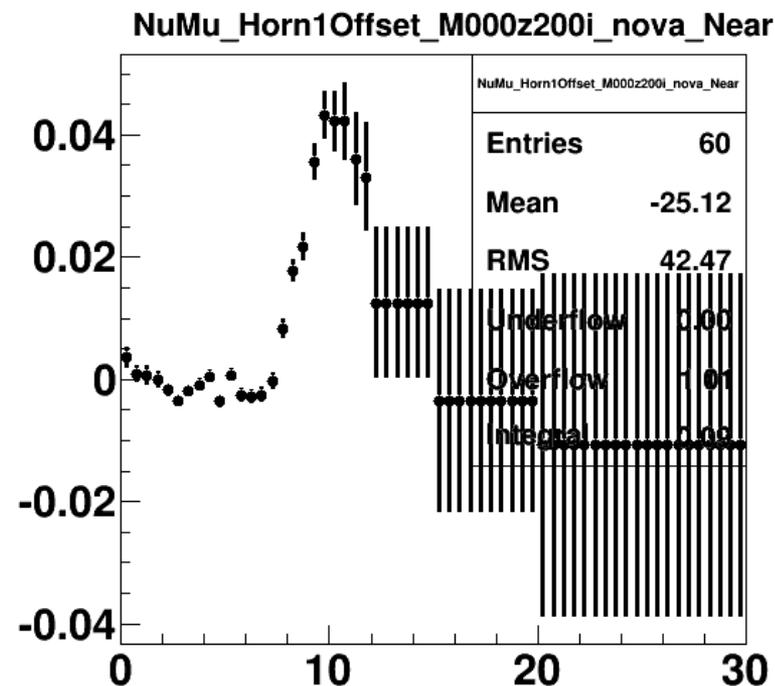
MINOS+ Summary Files - Ioana

- Ioana produced new summary files, needed 8 samples to feed into the fits:
- Horn On, Off; Nu, Anti-Nu; Data, MC;
- Ended up being a laborious process as Ioana needed to remake the summary files a number of times due to various issues we solved along the way
- Nevertheless, Ioana has produced several sets of summary files with different data and MC samplings for us to run various beam fits
- See Ioana's talk



Flux Beam Systematics AKA docdb 1283 - Adam

- Adam has run the most important flux beam systematics from docdb 1283
- Big task understanding and in some cases improving upon what had been done in the past
- Also very big task producing all the necessary special flux MC files to generate those error bands
- Error bands are inputs into two things:
 - Parameters in the beam fits
 - Contribution to total flux error in MCReweight package called to calculate the variable 'fluxerr' in the official analysis DSTs
- See Adam's talk



Making various code changes - Anna

- In order to use the flux errors generated by Adam for the beam fits, needed to implement several changes and went back and forth a lot. Most important things I can think of right now:
- One issue was to make code changes in BeamMegaFit/FitBeam to let the fitting code know what to do with the MINOS+ beam types (as per Conventions/BeamType)
- Small problem that Adam's histograms have 60 bins (up to 30GeV) and the old histograms had 100 bins (up to 50GeV)
- In practice not much of a problem and have implemented provisional fix and will change the histograms to go up to 50GeV in the long run (leaving the higher bins empty)
- The beamtype issue also meant that we had to redo the summary files with the correct naming schemes
- Various other edits to several other files to take care of stuff like target Z location for the new beam – this parameter is set to 0 at present and any other edits needed

Moving Forward

- We have managed to run successful MINOS+ fit(s)
- We are still running various versions, but will settle on one best one by Saturday
- May or may not use some of the parameters we fitted in the post (e.g. NC params)
- Do not need to have something perfect, just something that works reasonably well to give us hadron production error bands
- Next steps:
 - Calculate hadron production error bands
 - Incorporate them into a new version of the beam systematics file
 - Make a bunch of changes in MCReweight/SKZPweightcalculator and a couple of other spots to make those beam systematics (including hadron production) the official version for MINOS+
 - Commit the new weights from the fit we like best to the database so that they are picked up when making MINOS+ micro-dsts
 - Test all this by producing some micro-dsts to see if the mechanisms work well
 - Hopefully complete all this asap