Global PID

MICE CM39
25/06/14

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Introduction

In talk at CM37, briefly discussed PID using log-likelihoods and introduced framework.

In talk at CM38, introduced expansion of framework beyond single variables, and discussed using upstream tracker momentum vs TOF measurement as a PID variable.

Most up-to-date PID work can be found in bzr branch lp:~c-e-pidcott/maus/1389a

Updates on talk from CM38

- Single variable framework has been in MAUS since v0.8.2

- Expansion of framework to use 2D PDFs and Tracker/TOF variable implemented and in MAUS since v0.8.4

- Global PID documentation has been incorporated into MAUS User Guide, now in the merge branch.

Beyond TOFs and trackers

- Focus has previously been on TOF and tracker information as these were the only detector reconstructions sufficiently implemented in MAUS.

- KL can now be used (although tuning of digitization is ongoing).

- Waiting on EMR and Ckov.

- In preparation for using KL, EMR and Ckov, expanded global datastructure to include ADC charge and charge product, and number of photo electrons.

- Also written code to import KL and Ckov detector information into global datastructure

Potential future PID variables

- **Ckovs:** Due to the difference in threshold at different momenta for different particles for CkovA and CkovB, a variable could be made of a boolean nature to distinguish between muons or pions.

- **KL:** ADC charge product allows some separation between electrons and muon/pions, however there is a momentum dependence; potentially remove using momentum measured by downstream tracker.

- **EMR:** Energy per plane per event (shown on slide 7) separates well between particles, again may be necessary to couple with tracker momentum.
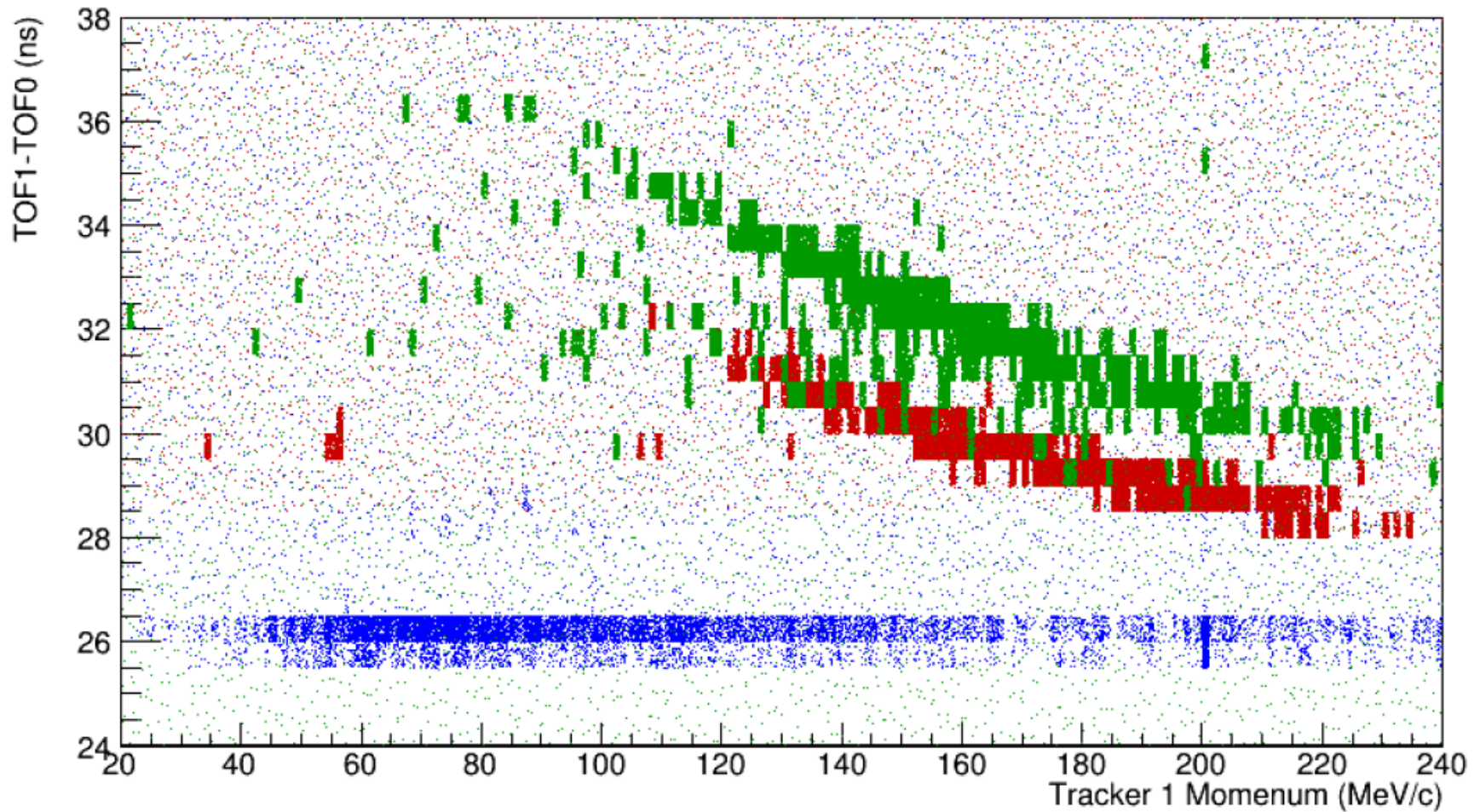
Additional Slides
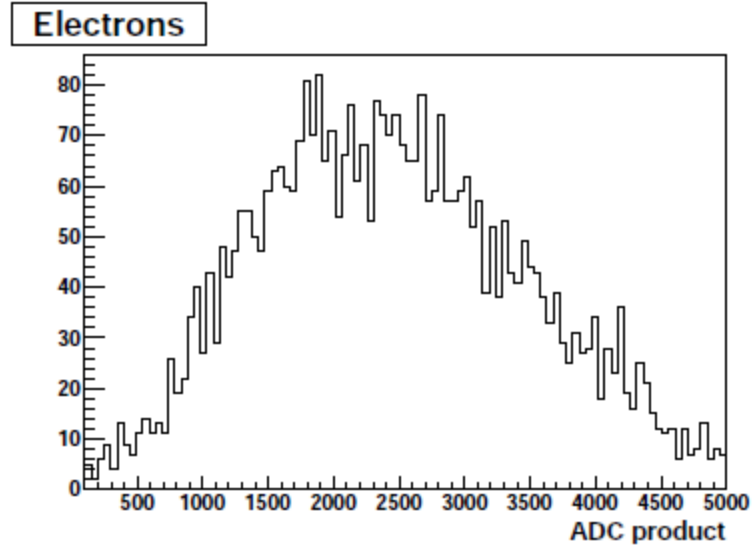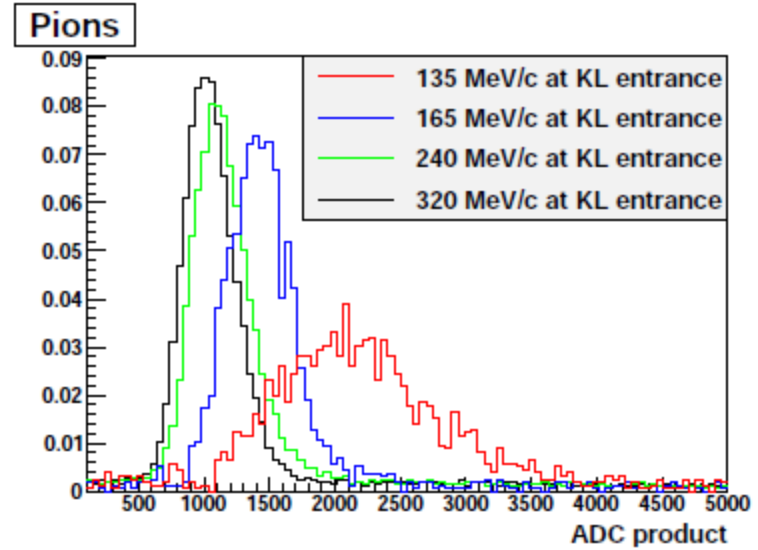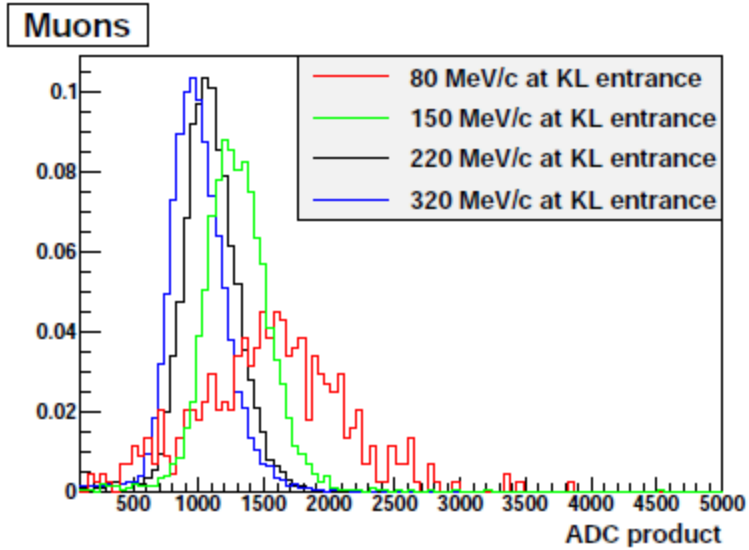
KL response (taken from arXiv:1203.4089v2)
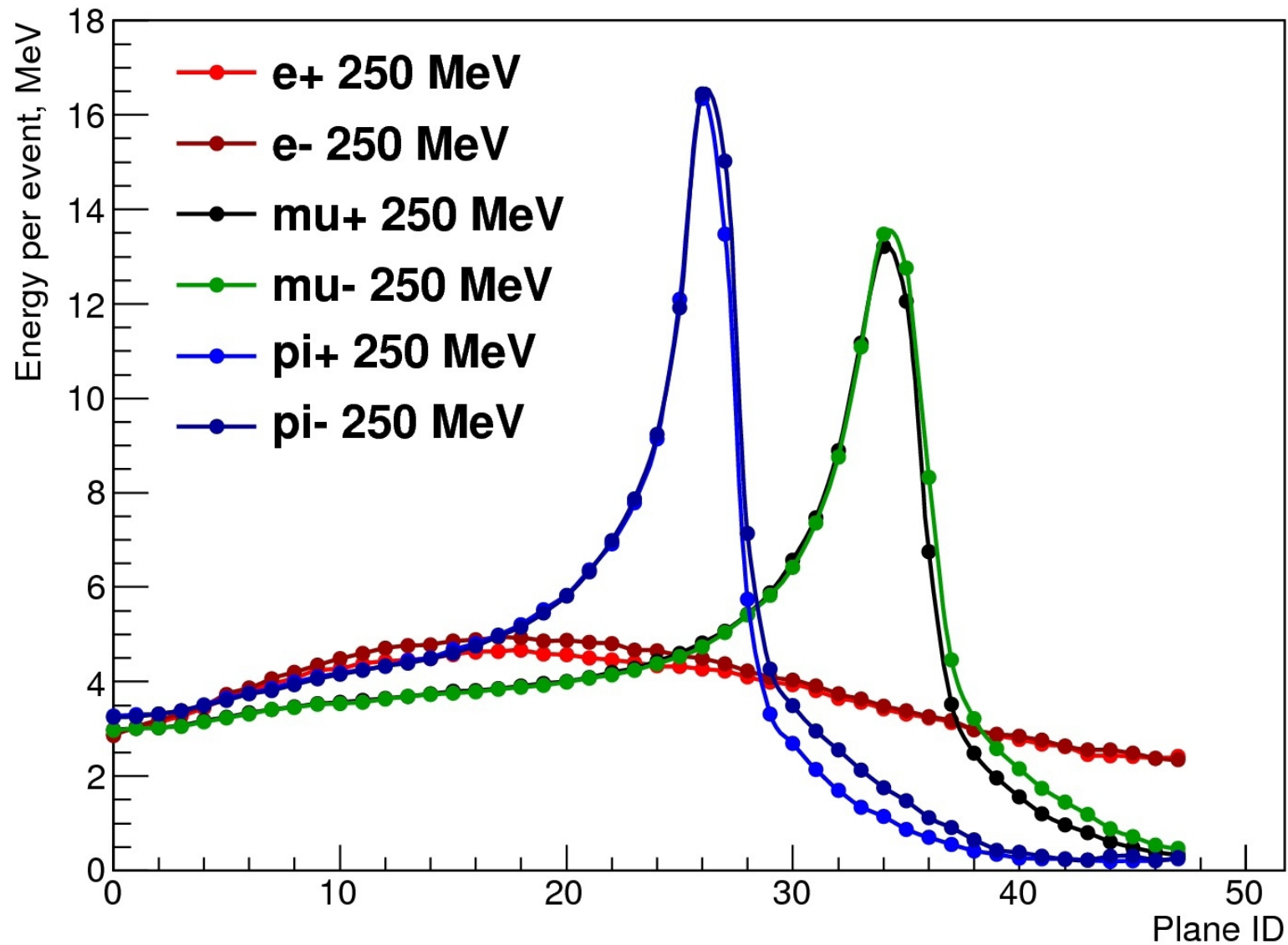
Average energy per plane per event in EMR for muons, electrons and pions (taken from MICE Note 388)

Upstream tracker momentum vs upstream time of flight, for pions (green), muons (red) and positrons (blue).