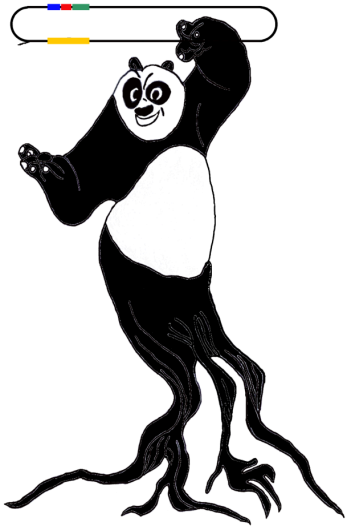
PID with PandaRoot

Malgorzata Gumberidze

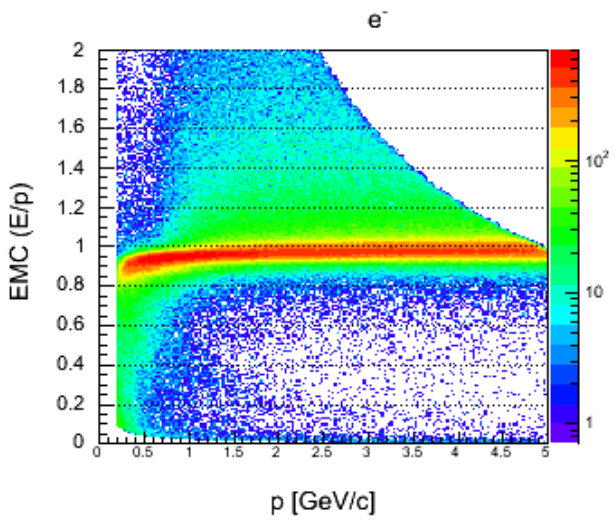


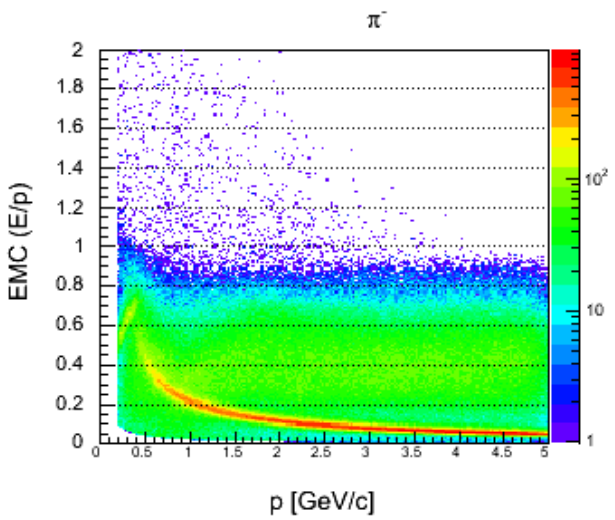
What has been used :

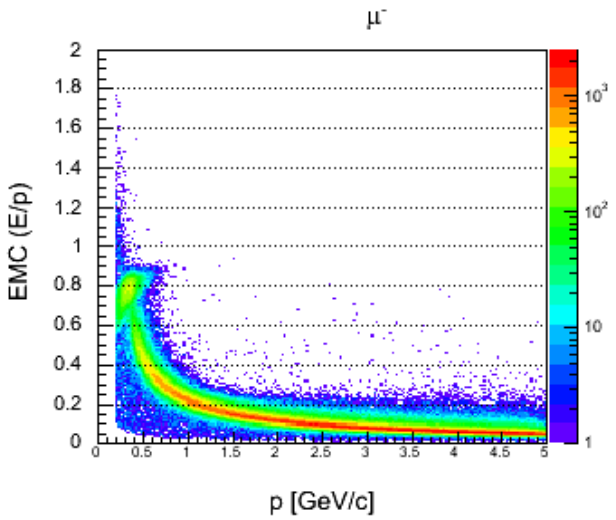
- PANDAroot version: 17845 (from 09.11.2012)
- 10^6 events for each negative particles
- Using build in PID algorithms:

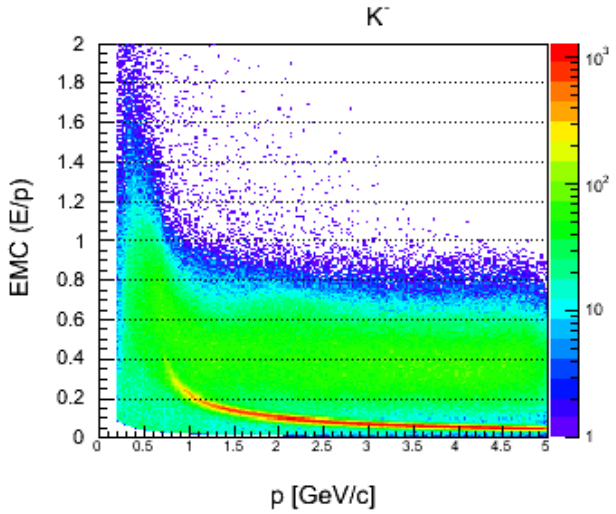
  - ✓ EMC: Bayes method (E/p, log(Z53), log(Lat))
  - ✓ STT: de/dx vs p : Gauss parametrization
  - ✓ DRC and DSC: thetaC vs p : Gauss parametrization
  - ✓ MVD: de/dx vs p : Gauss parametrization

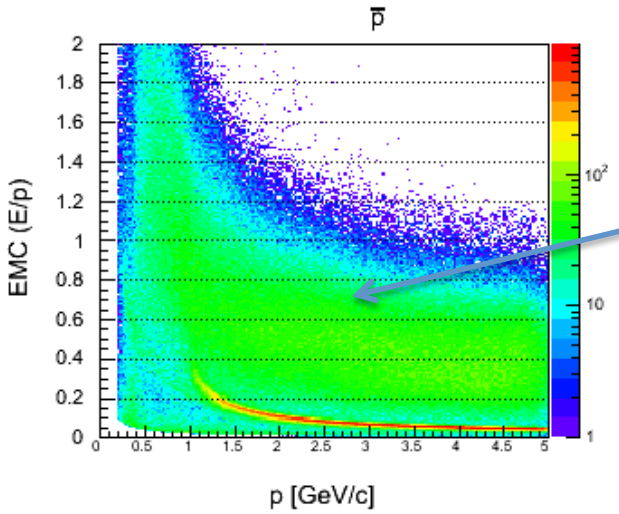
Some spectra from the detectors
EMC: negative particles





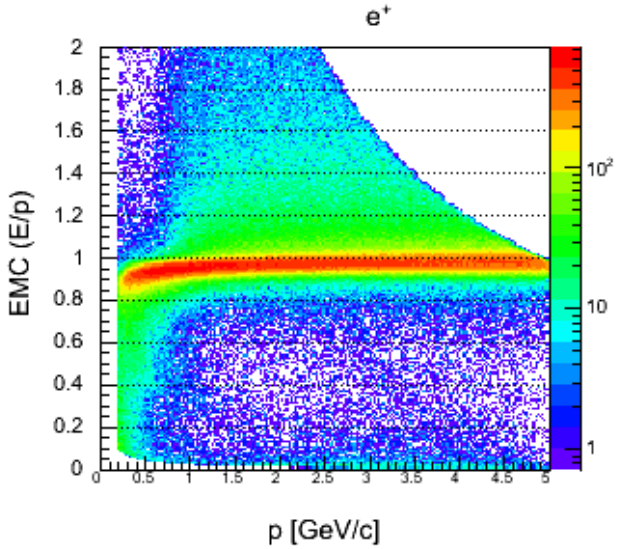


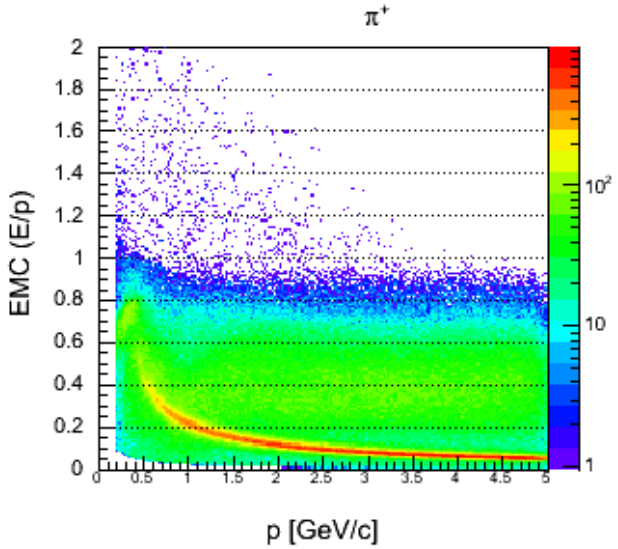


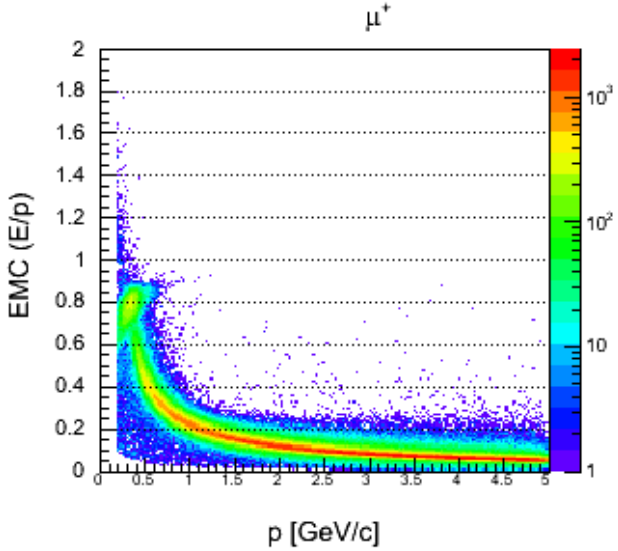


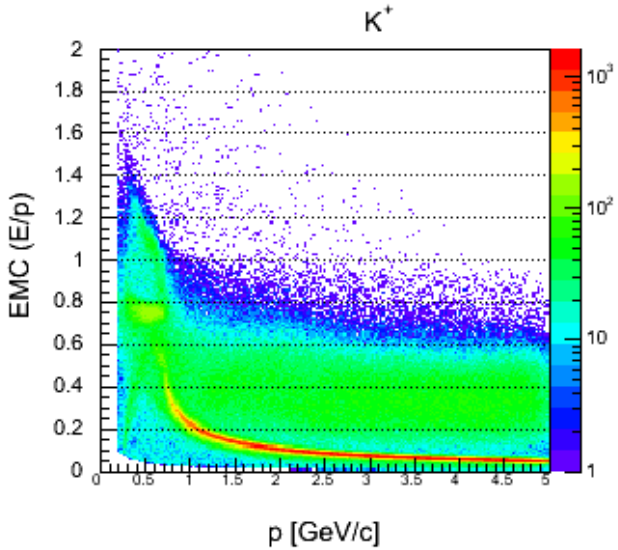
annihilation

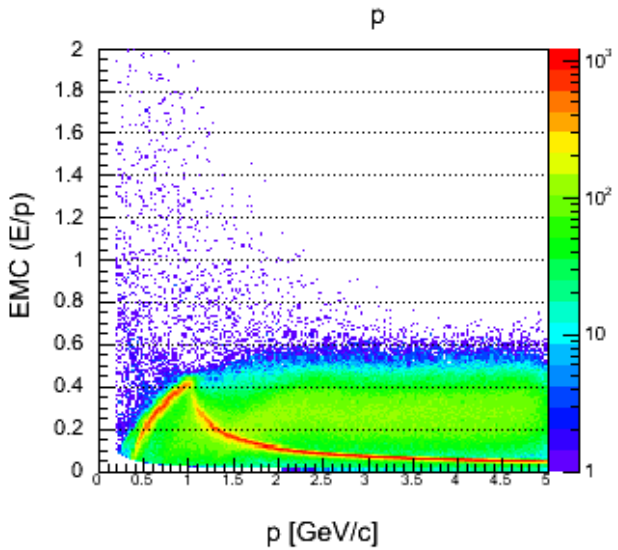
Some spectra from the detectors
EMC: positive particles



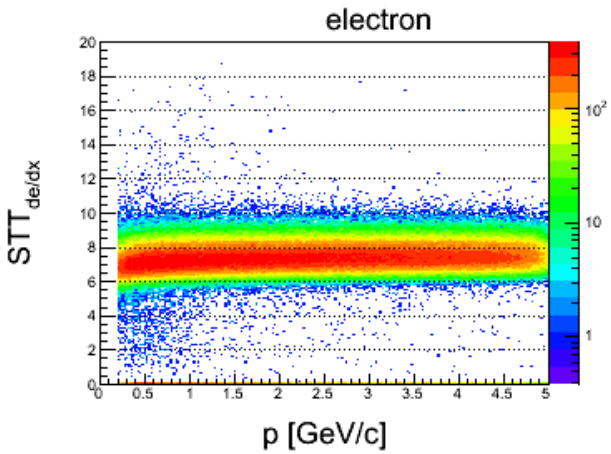


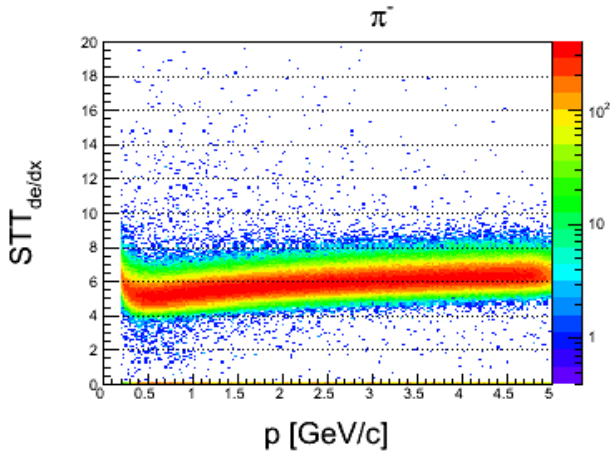


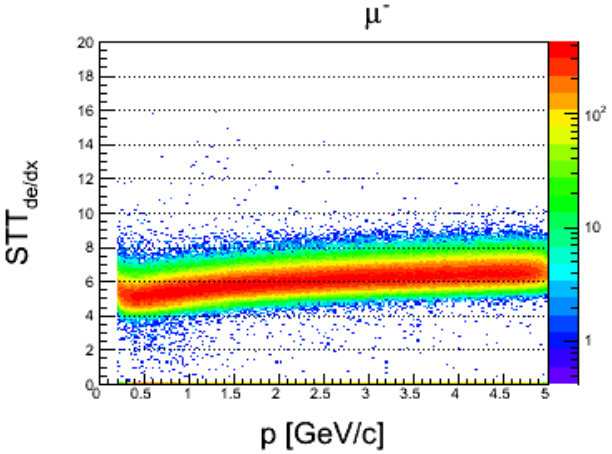


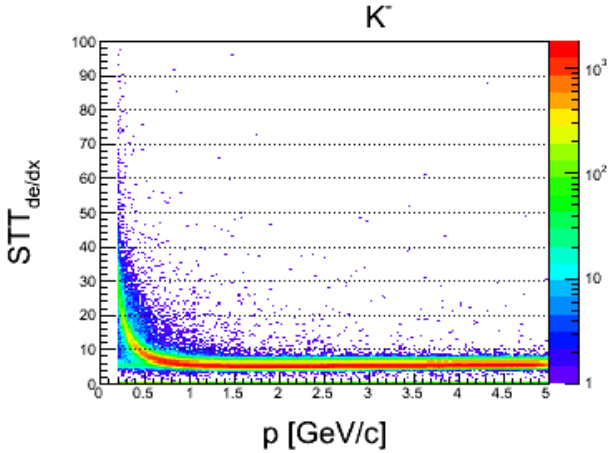


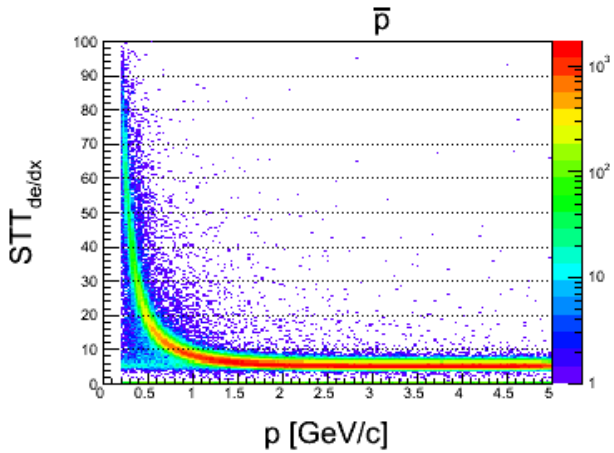
Some spectra from the detectors
STT dE/dx

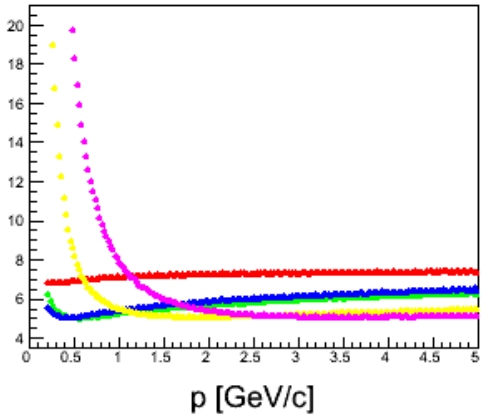




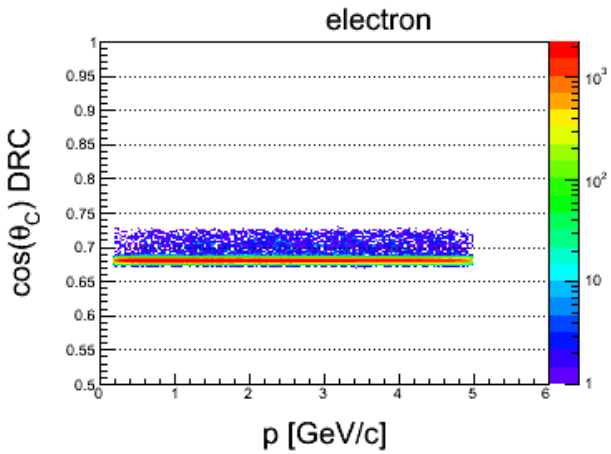


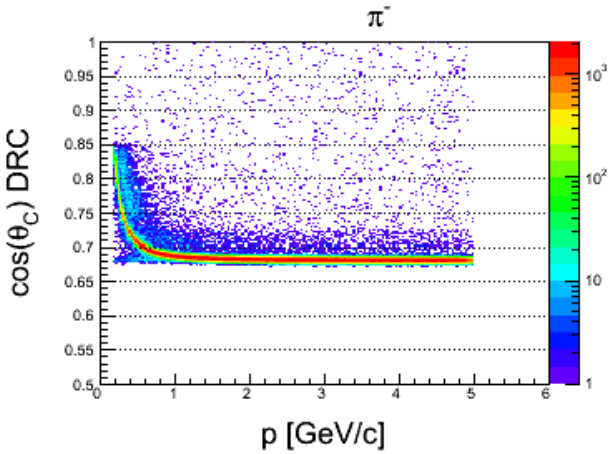


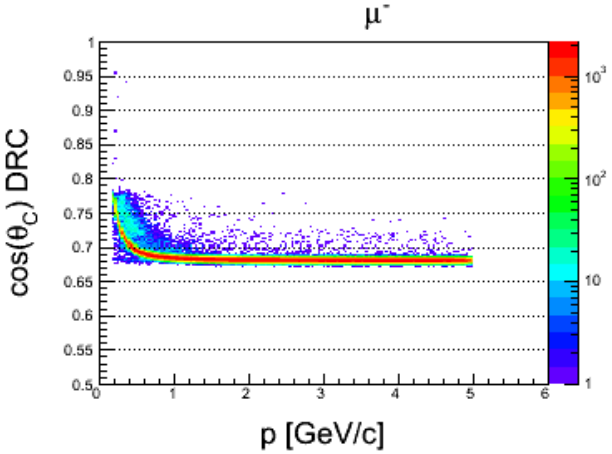


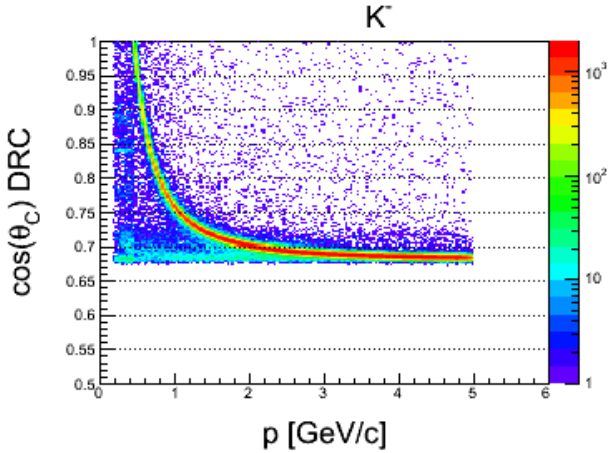


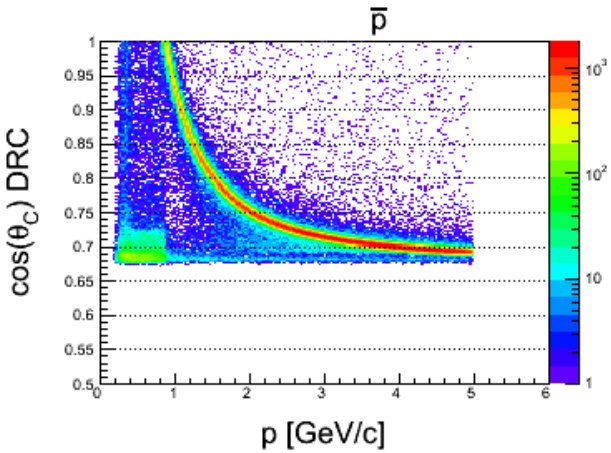
Some spectra from the detectors
DRC: thetC



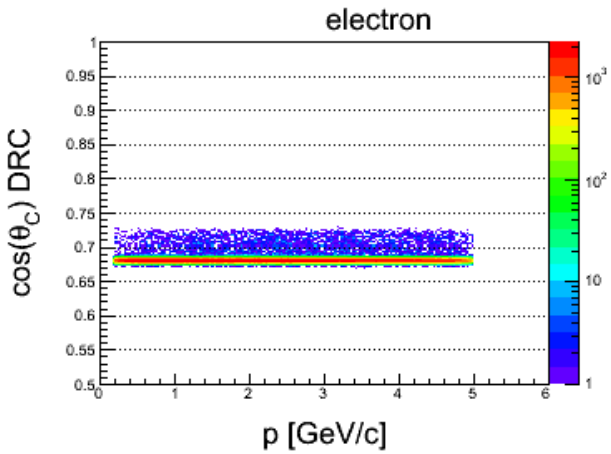


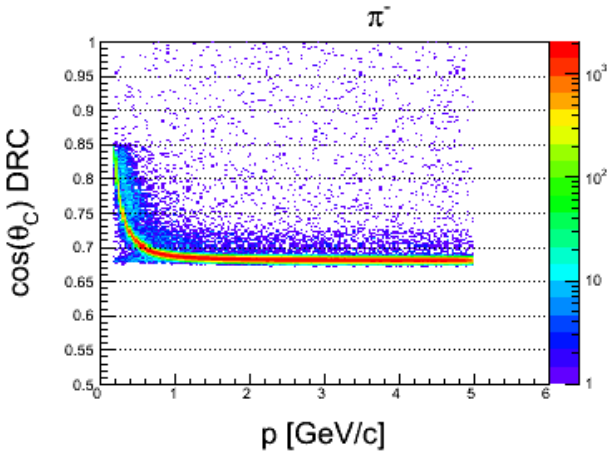


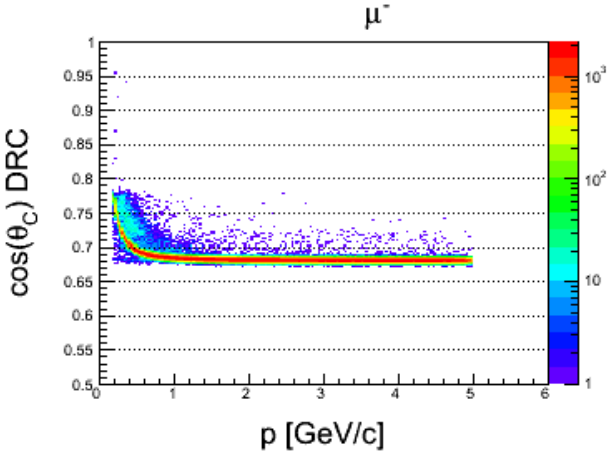


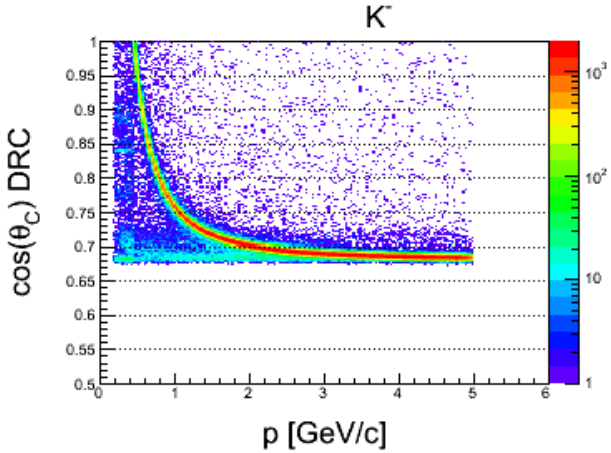


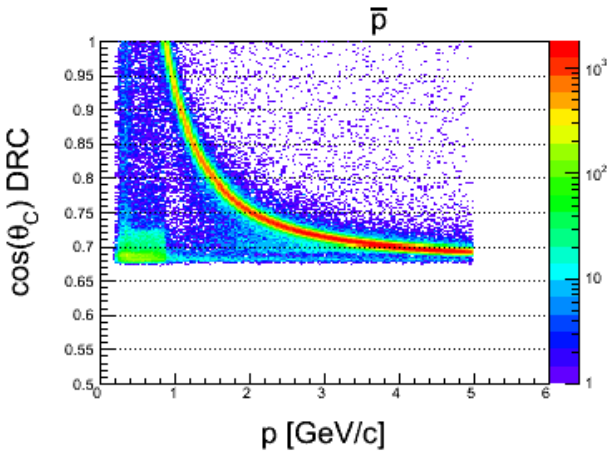
Some spectra from the detectors
DRC: thetC



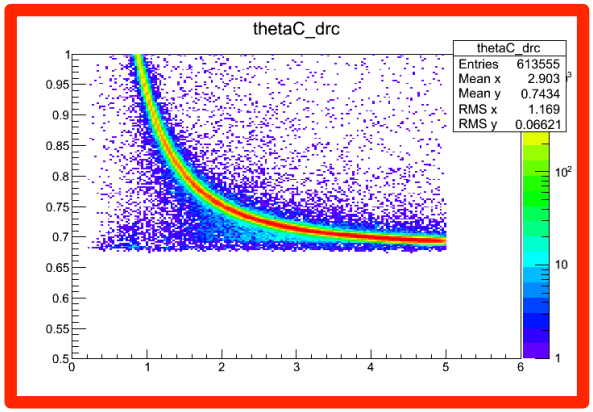




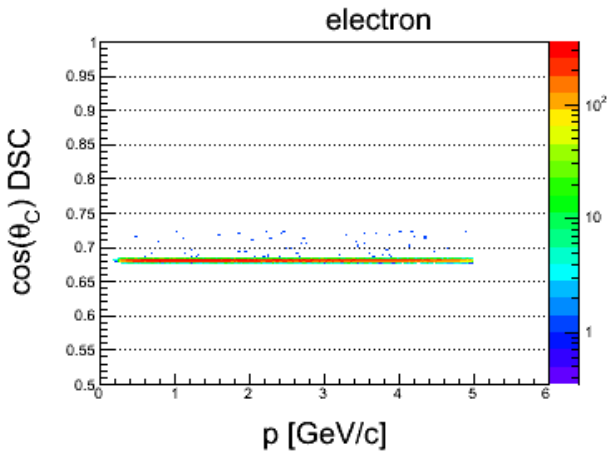


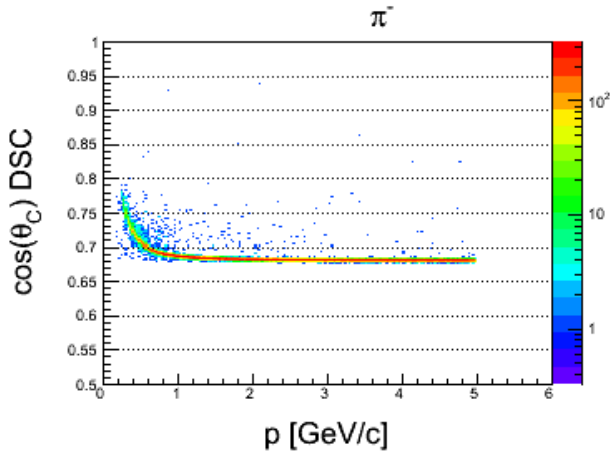


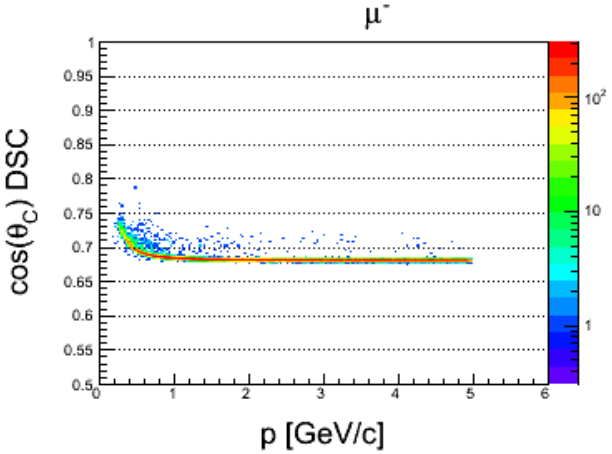
proton

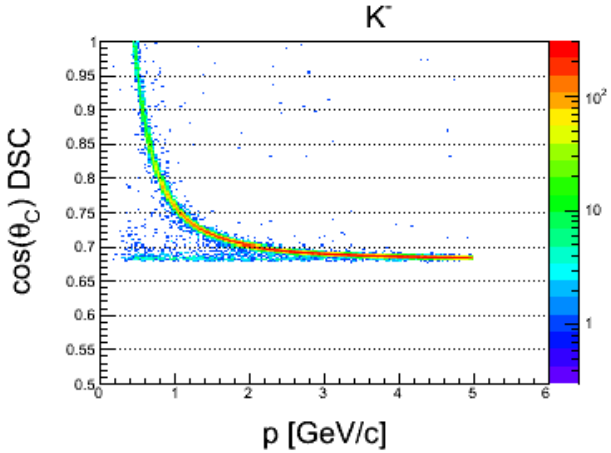


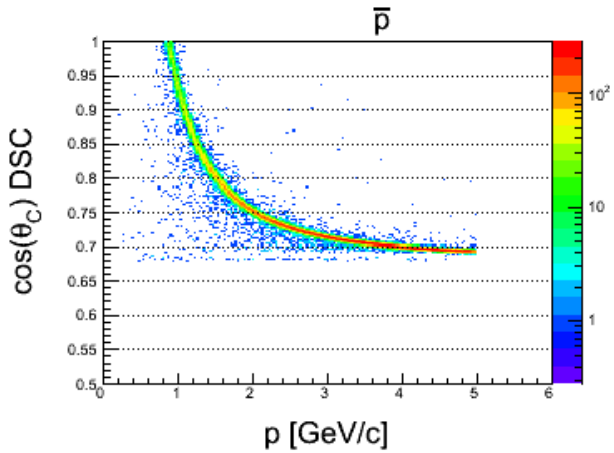
Some spectra from the detectors
DSC: thetC











Some definitions used over the slides

Signal : particle **X**
Background : particle **Y**

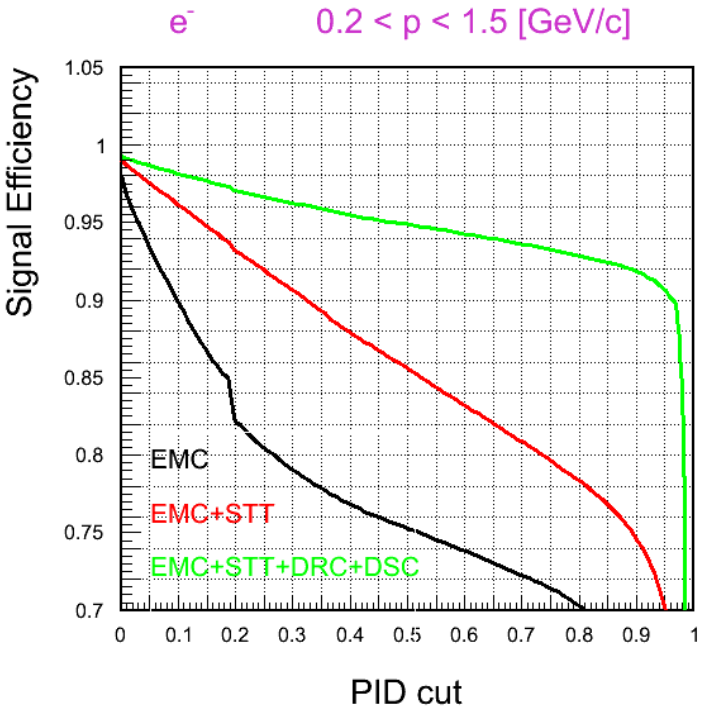
PID^X : cut on PID for particle X or Y to be X

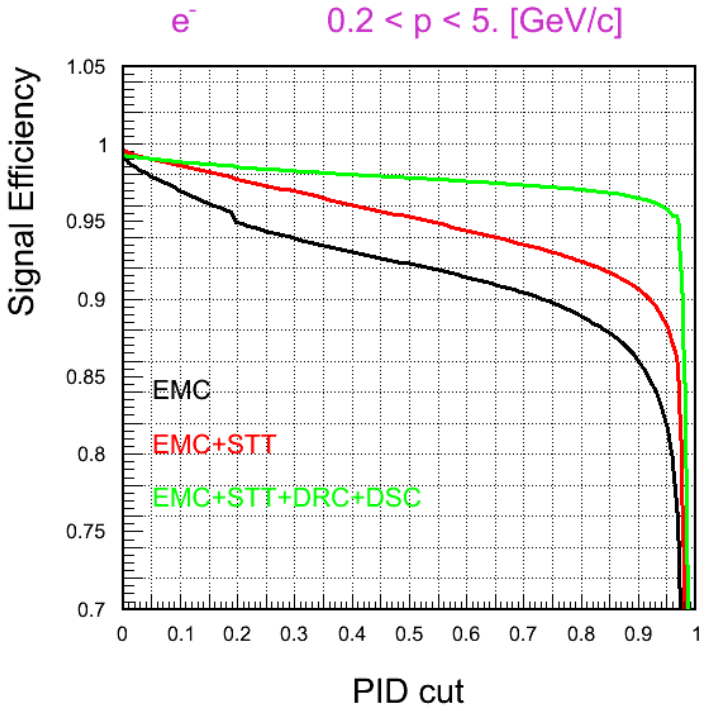
$$Eff = \frac{Yield(X) > PID^X}{Yield(X)}$$

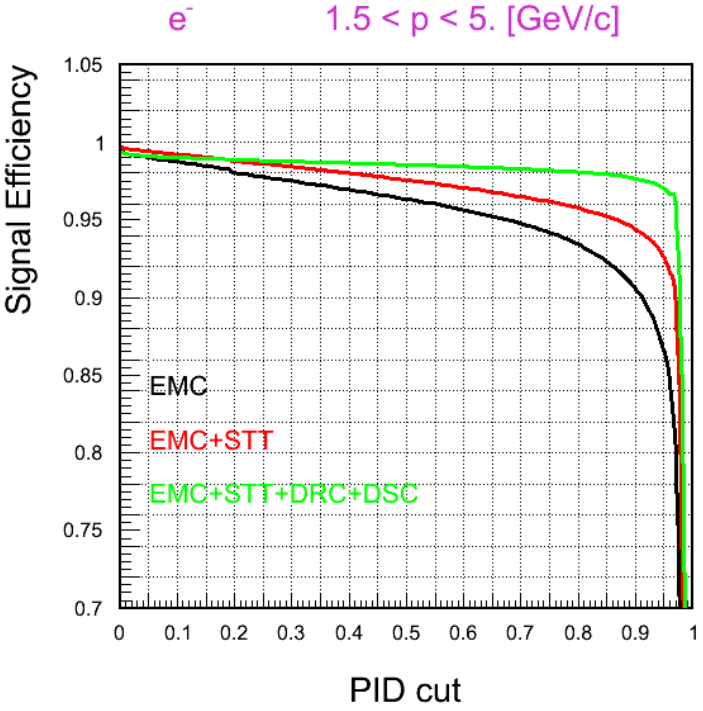
$$MisID = \frac{Yield(Y) > PID^X}{Yield(Y)}$$

Background rejection : 1-MisID

Electron identification efficiency study





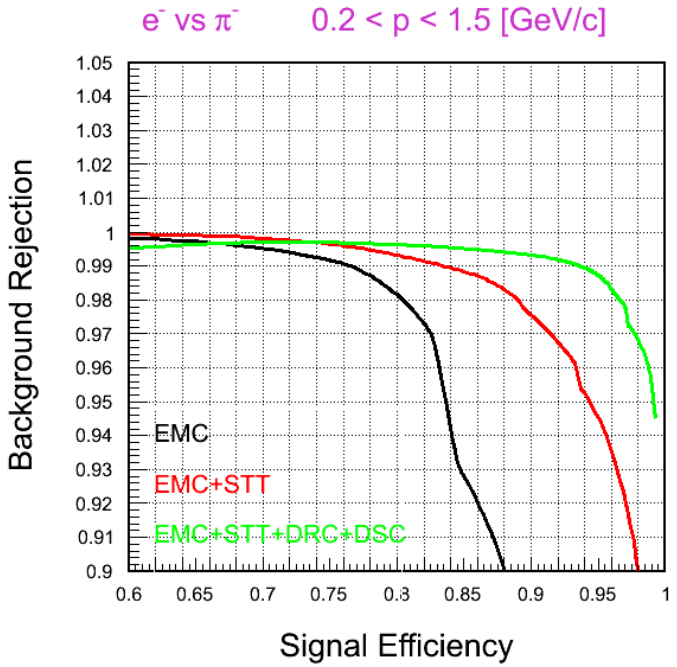


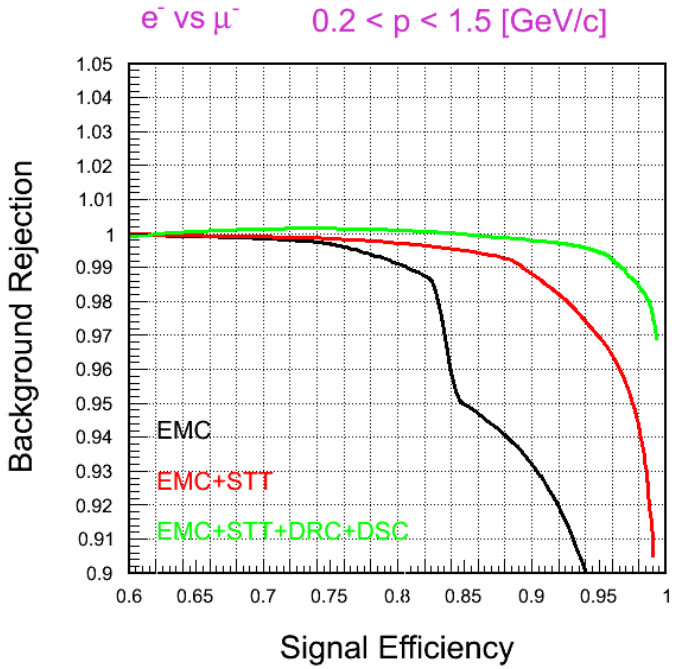
- At low electron momenta there is a big help from **DRC, DCS** in addition to **EMC+STT**
- At higher momenta, already **EMC+STT** make good job
- But what about mis-identifications of the other particles ?

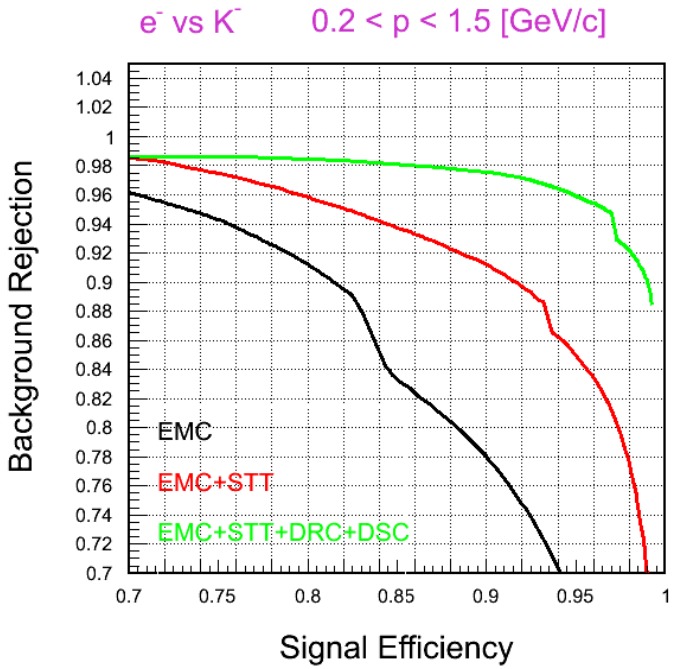
Electron identification

misidentification from K, π, μ, p

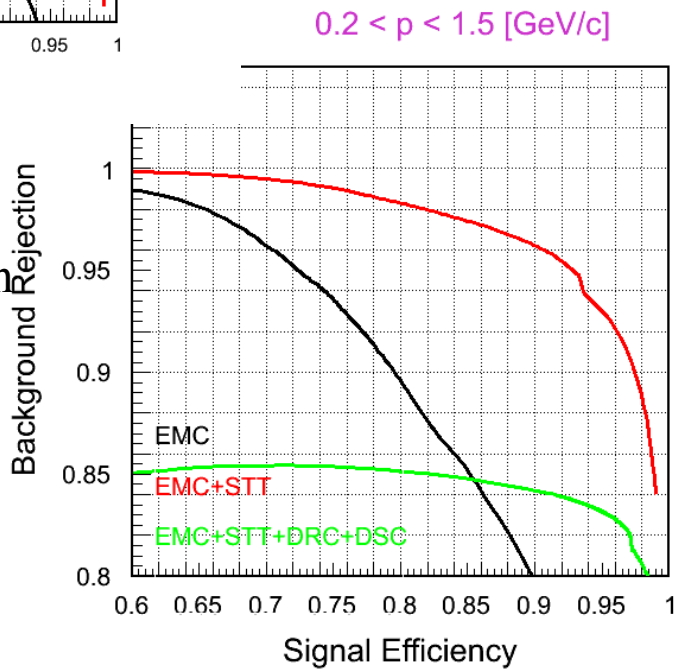
low momenta







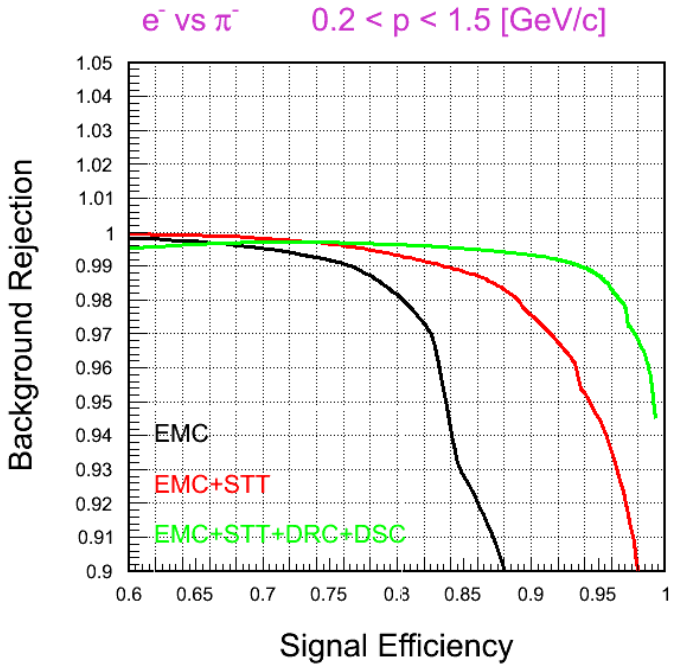
- At low electron momenta there is a big improvement from **DRC, DCS** comparison to **EMC+STT** in order to reduce misidentification from **π, μ, K**
- **p : ?**

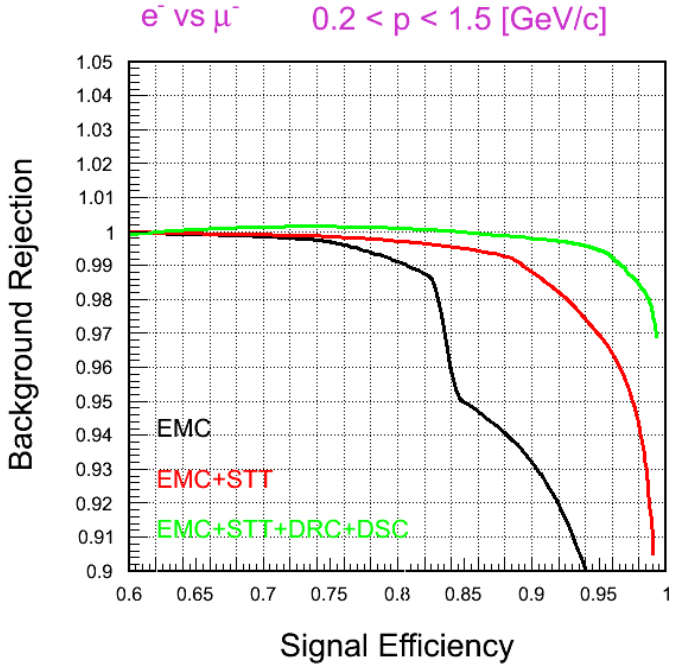


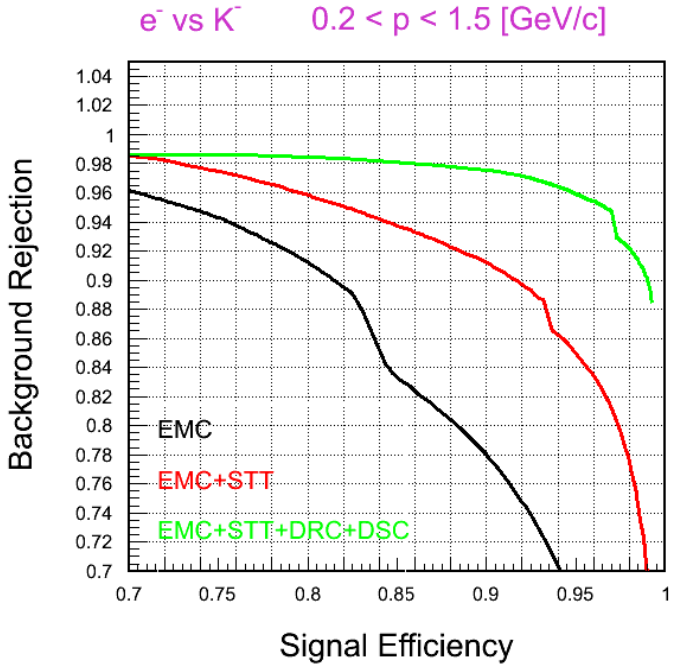
Electron identification

misidentification from K, π, μ, p

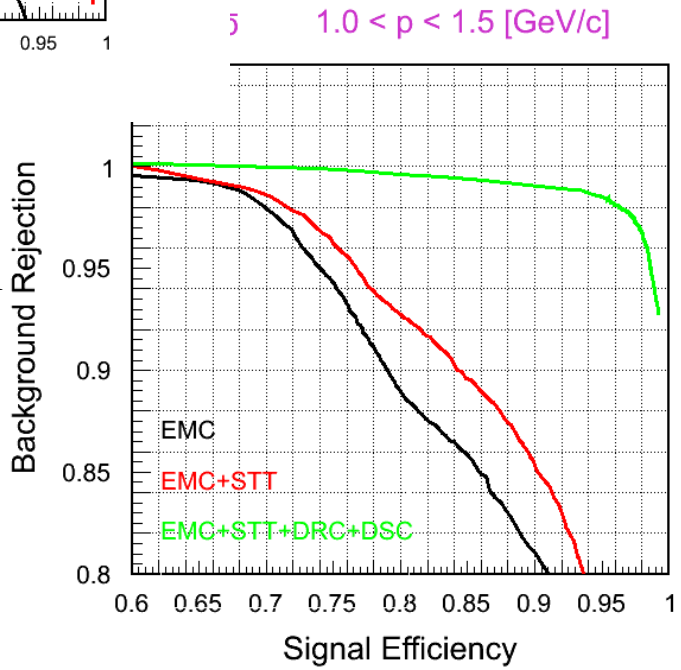
low momenta







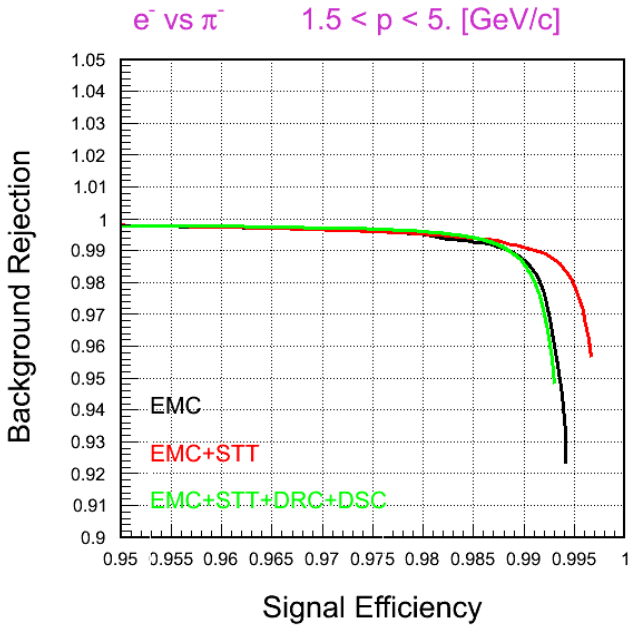
- At low electron momenta there is a big improvement from **DRC, DCS** comparison to **EMC+STT** in order to reduce misidentification from **π, μ, K**
- **p :** DRC does not provide PDF below 1GeV/c

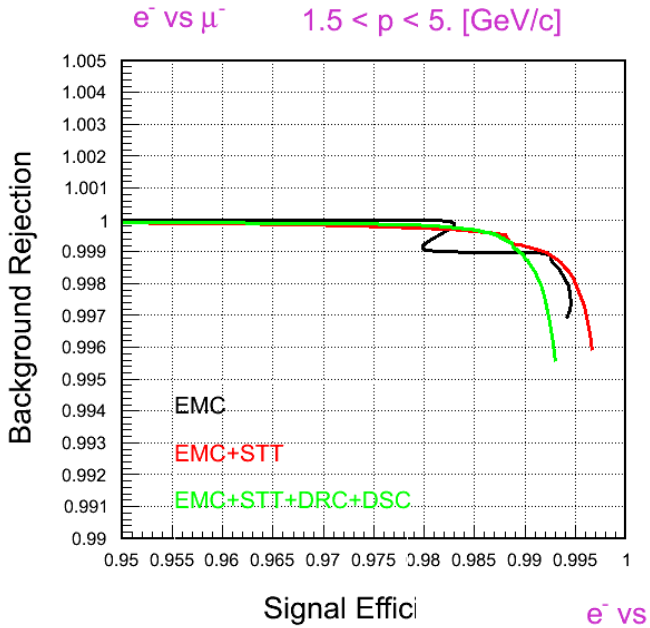


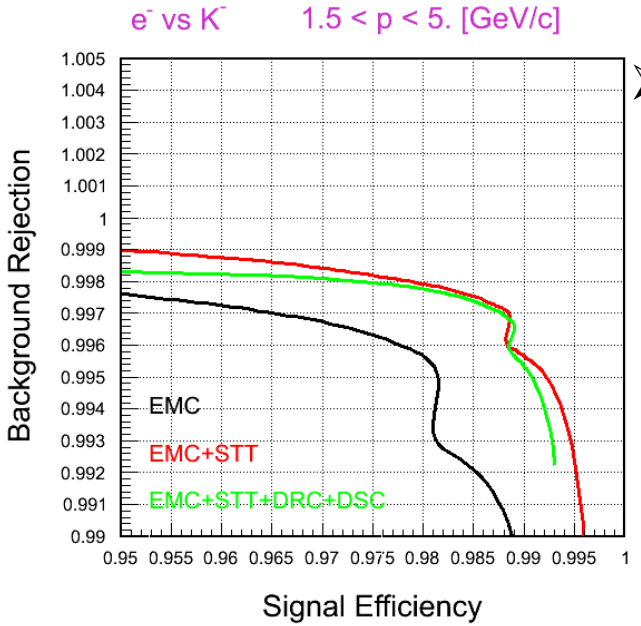
Electron identification

misidentification from K, π, μ, p

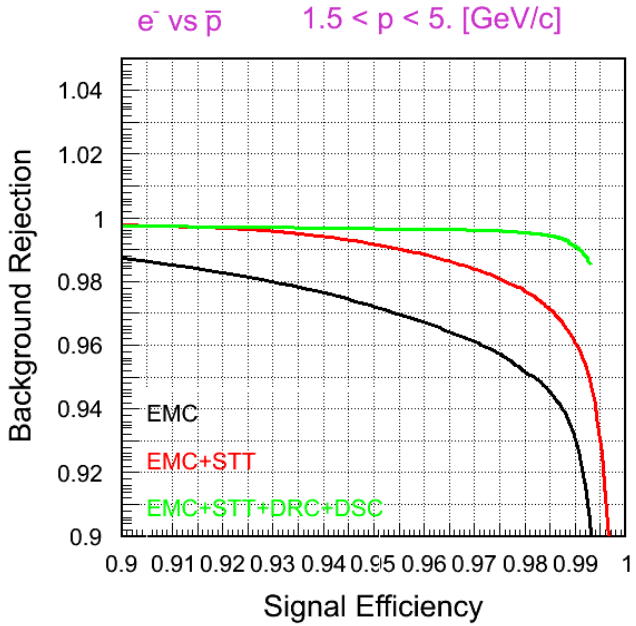
high momenta

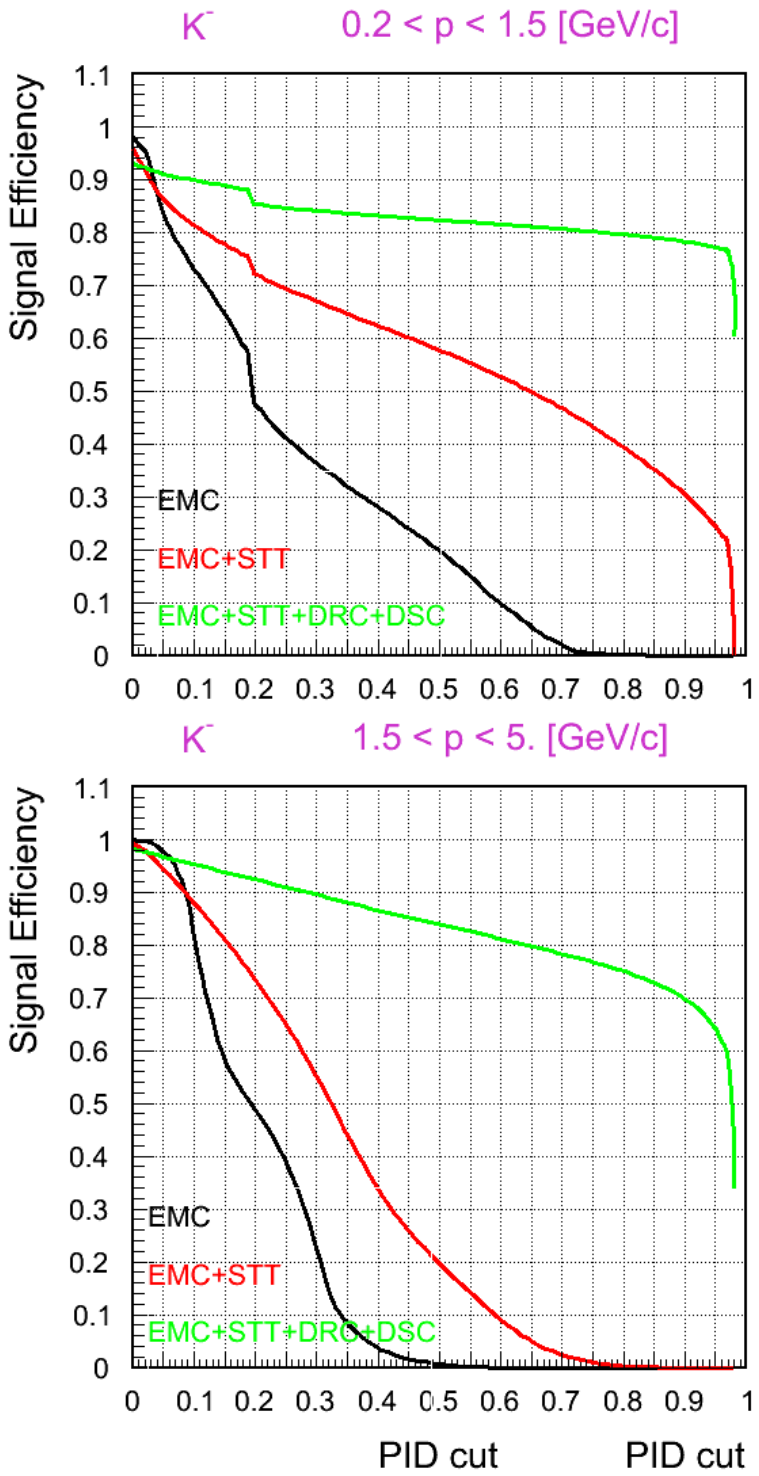






- misidentification
  - **π, μ, K**
    - **EMC+STT**
    - **EMC+STT+ +DRC+DSC**
  - **p**
    - **EMC+STT+ +DRC+DSC**





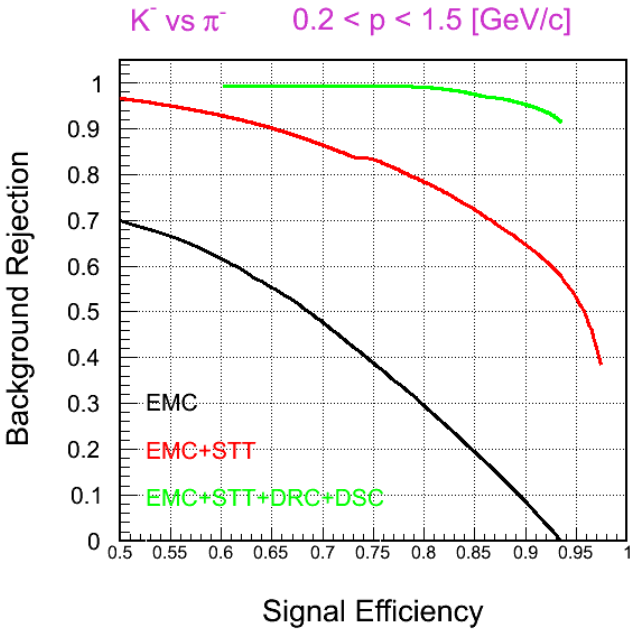
Kaon identification efficiency study

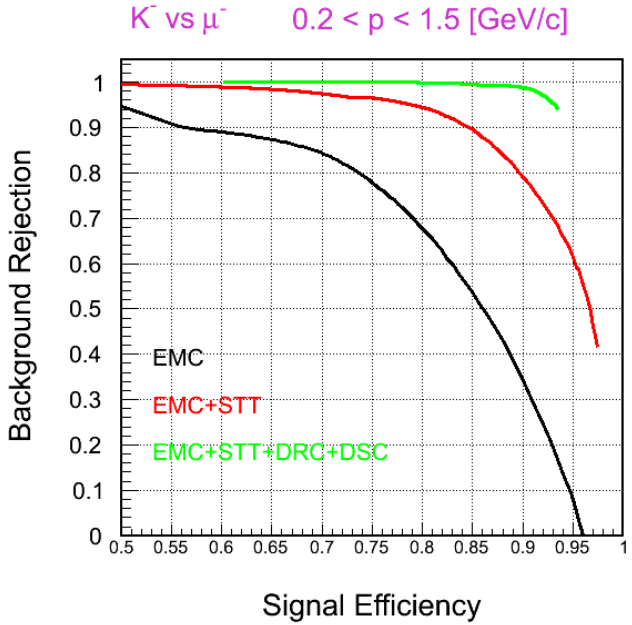
- In full momentum range **DRC+DCS** in addition to **EMC+STT** improve **K** identification efficiency

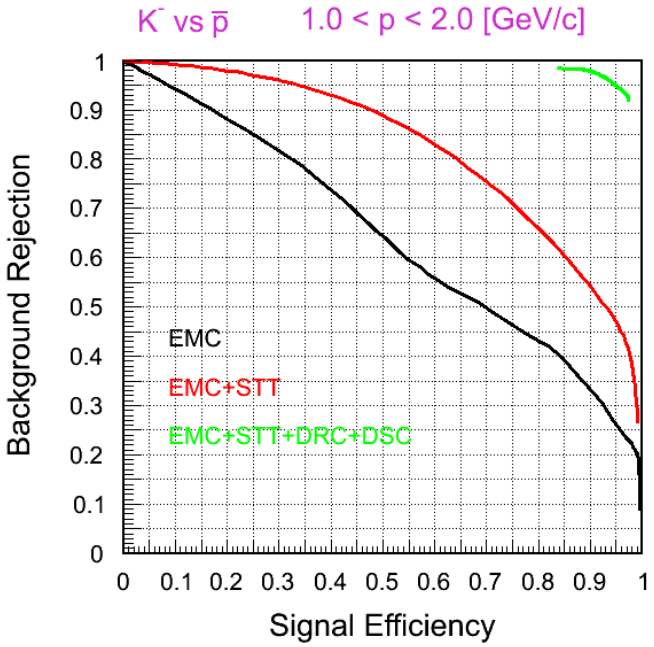
Kaon identification

misidentification from e, π, μ, p

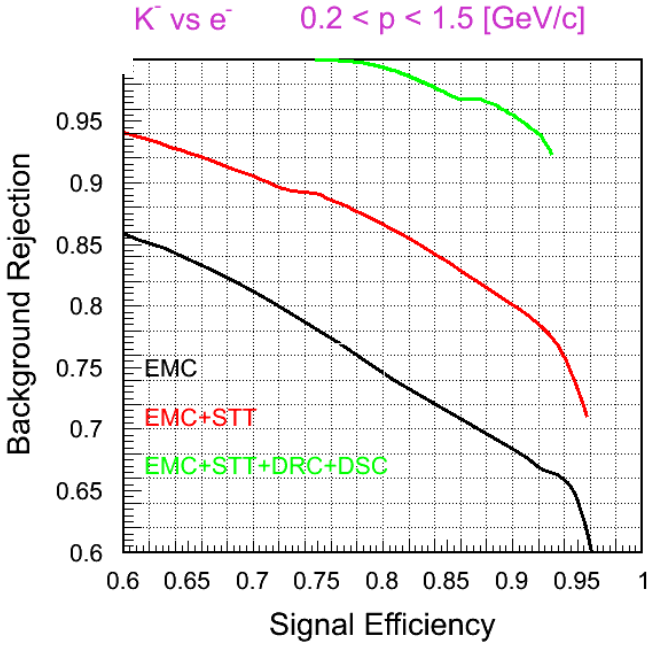
low momenta







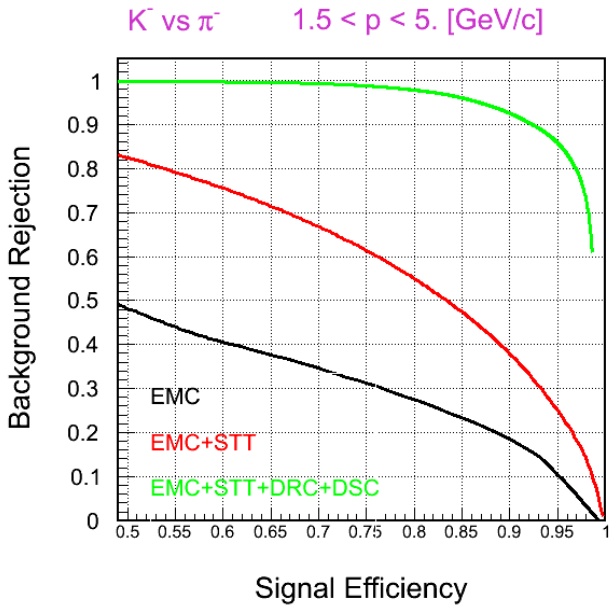
- At low momenta there is a big help from **DRC, DCS** in addition to **EMC+STT** in order to reduce misidentification from **π, μ, K,**
- **p** : no Pdf from DIRC for p < 1 GeV/c

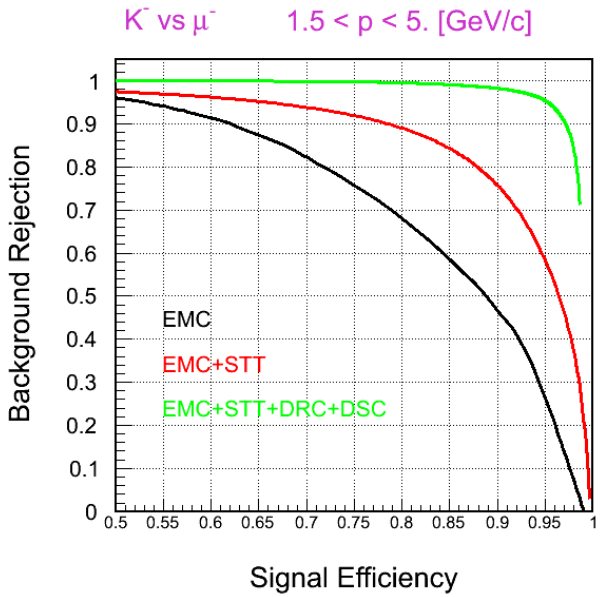


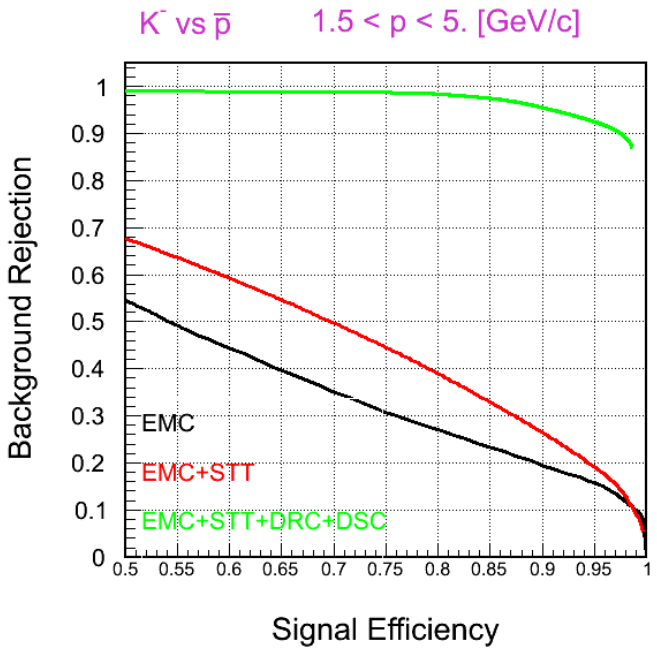
Kaon identification

misidentification from e, π, μ, p

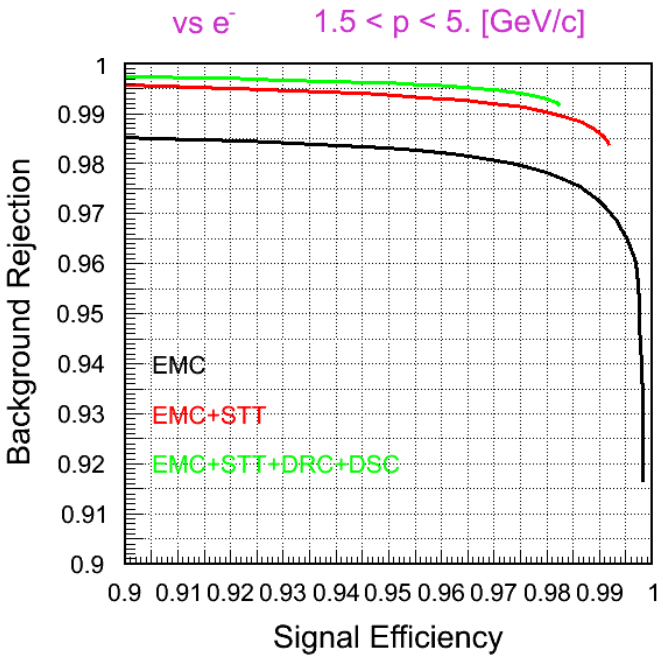
high momenta

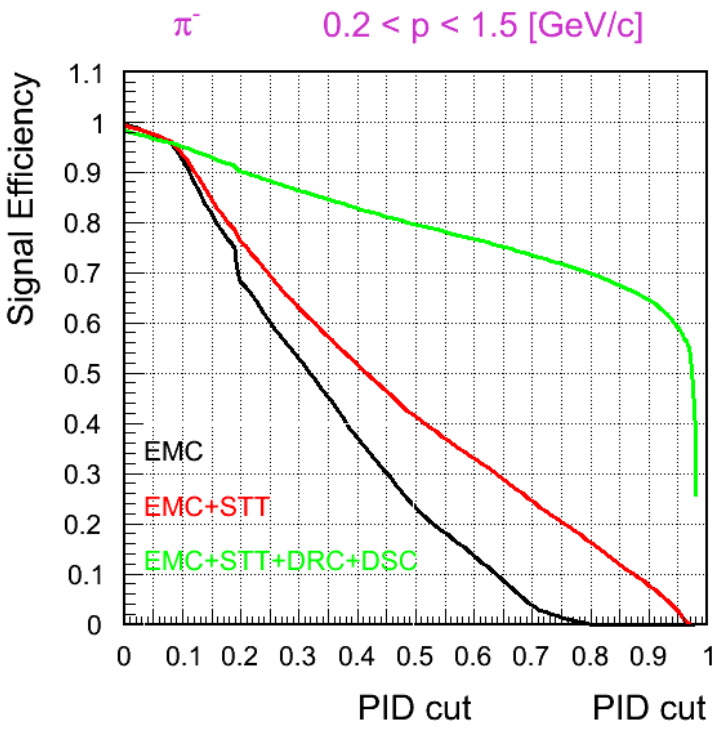


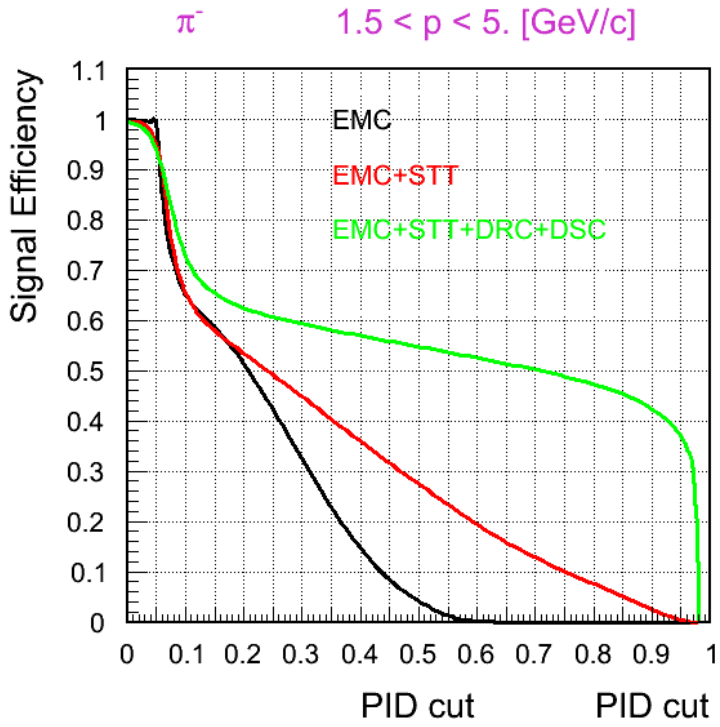




➢ **Great improvement** in reducing misidentification from **π, μ, K, p** using **DRC, DCS** in addition to **EMC+STT**







Pion identification efficiency study

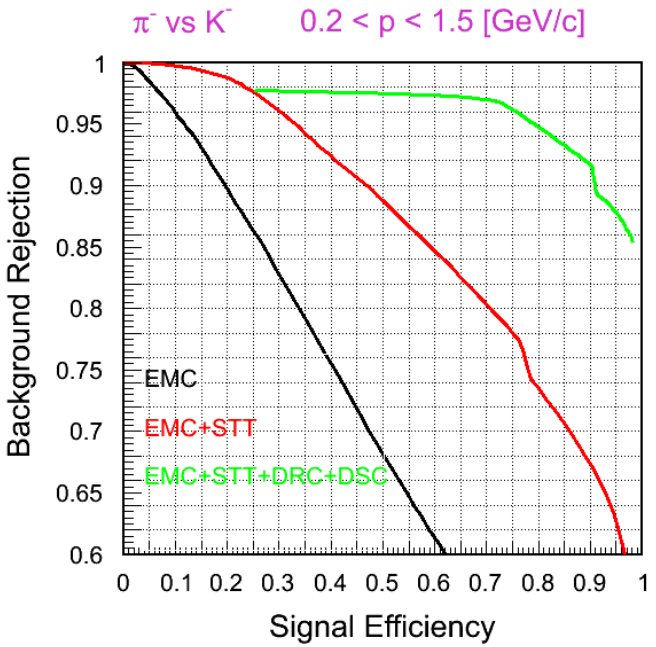
- In full momentum range **DRC+DCS** in addition to **EMC+STT** improve **K** identification efficiency

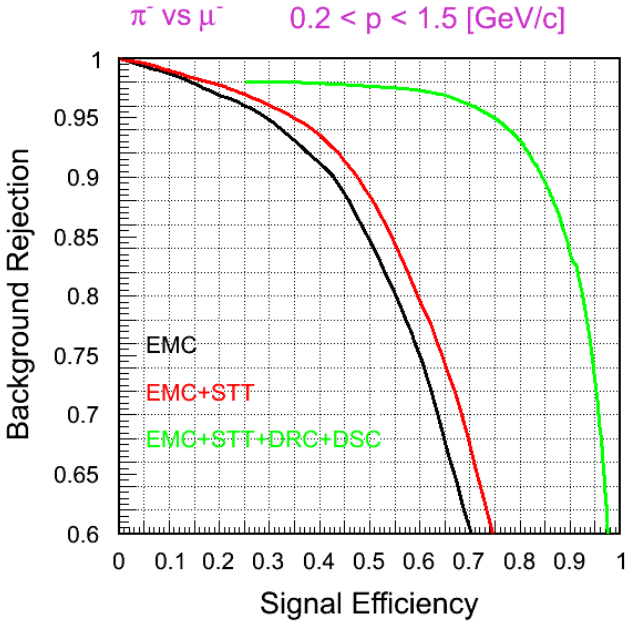
- It is not clear for me, why for the higher momenta performance does down ?

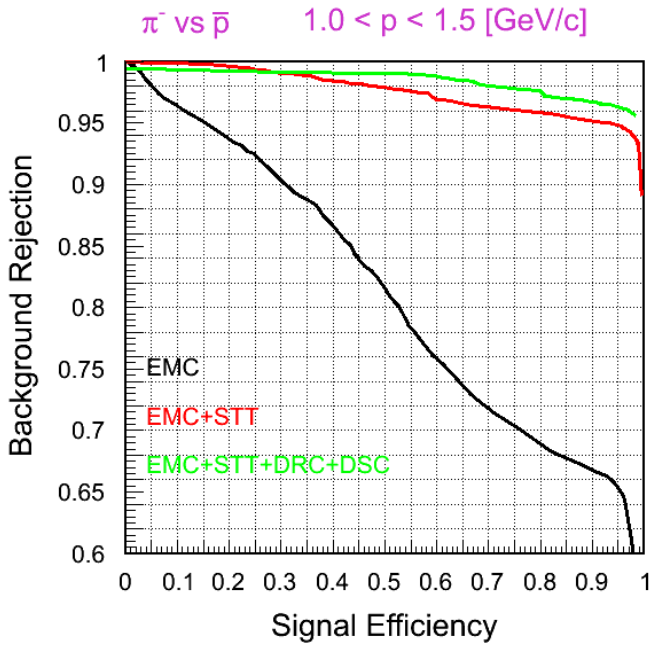
Pion identification

misidentification from e, K, μ, p

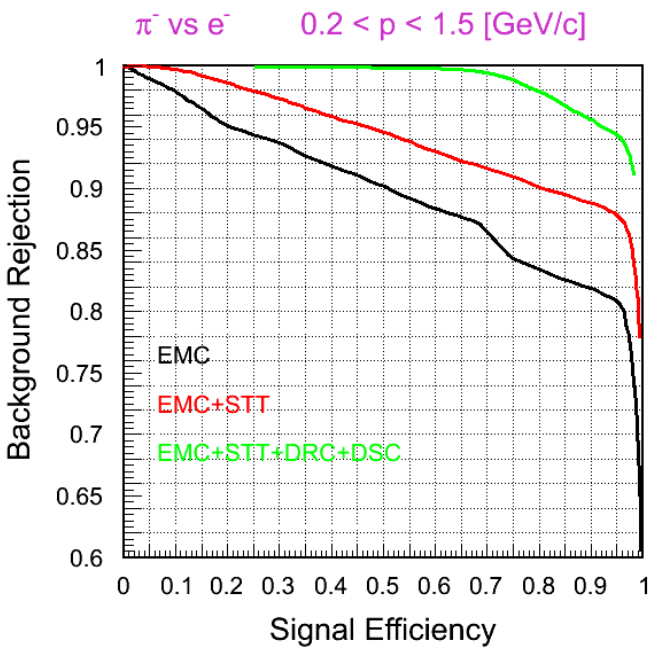
low momenta







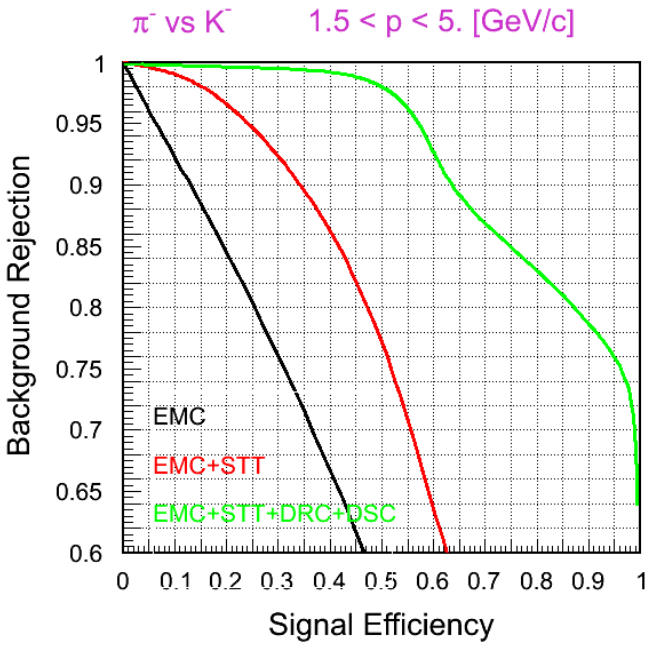
- At low momenta there is a big help from **DRC, DCS** in addition to **EMC+STT** in order to reduce misidentification from **π, μ, K,**
- **p** : no Pdf from DIRC for p < 1 GeV/c

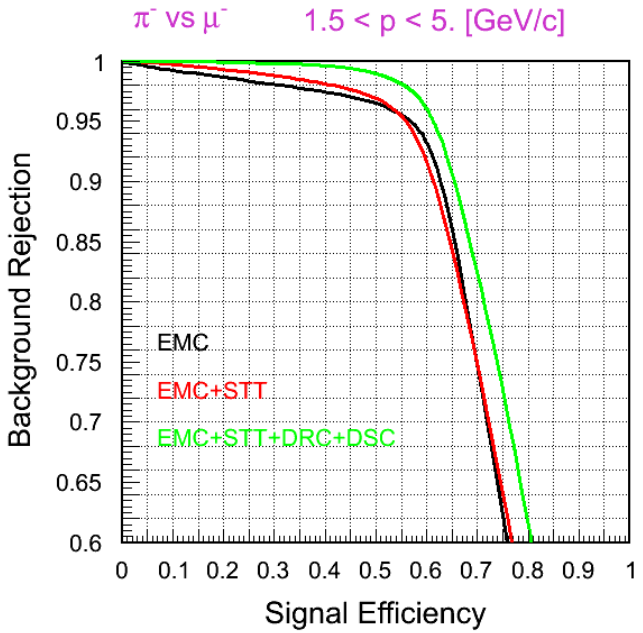


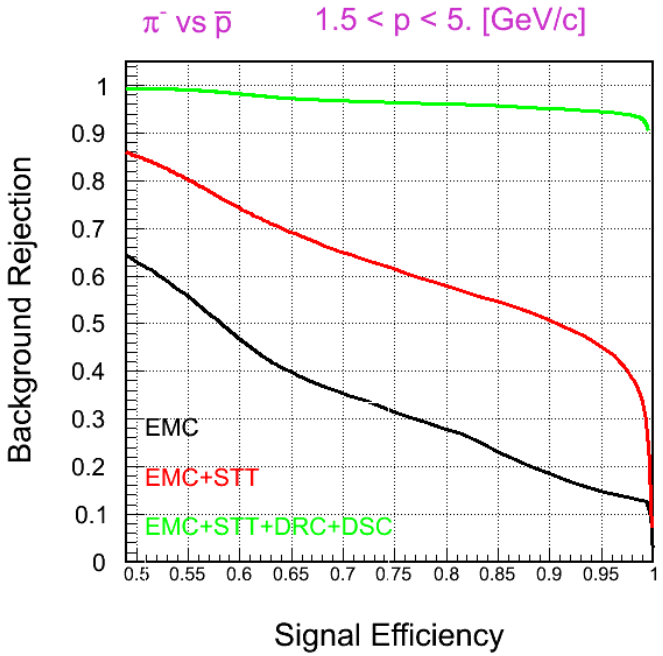
Pion identification

misidentification from e, K, μ, p

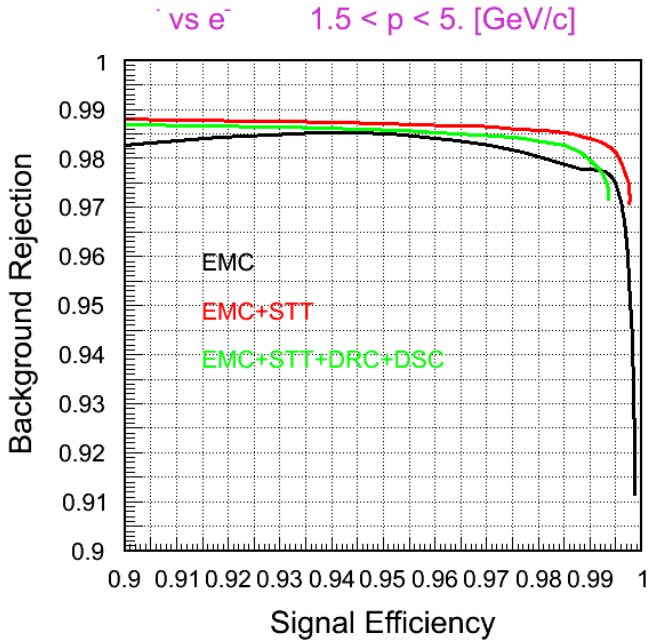
high momenta







➢ **Great improvement** in reducing misidentification from **π, μ, K, p** using **DRC, DCS** in addition to **EMC+STT**

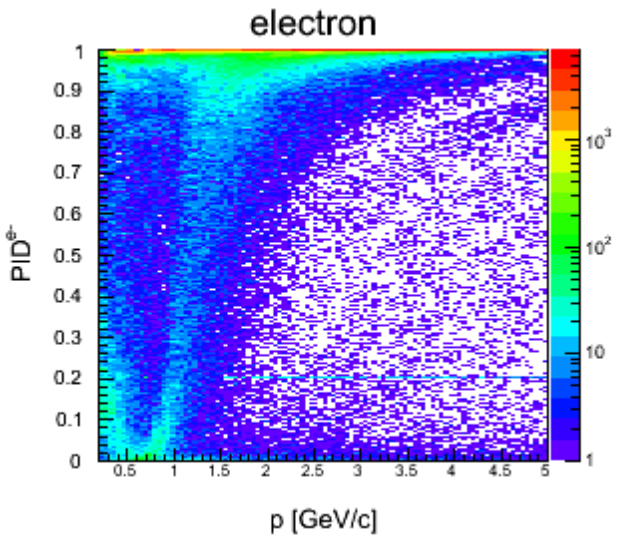


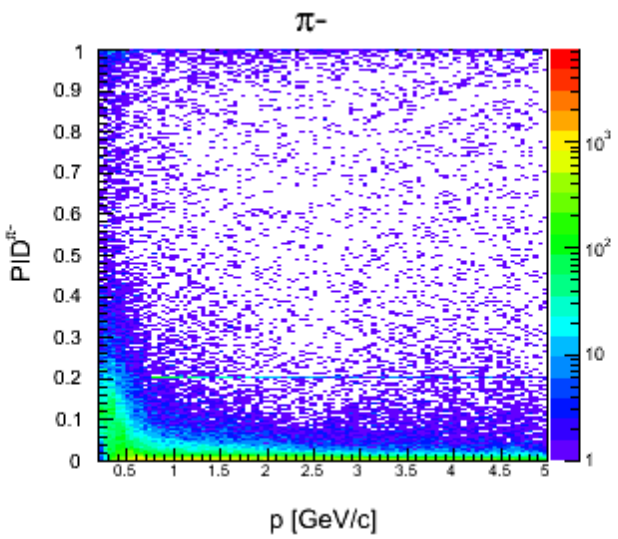
Summary

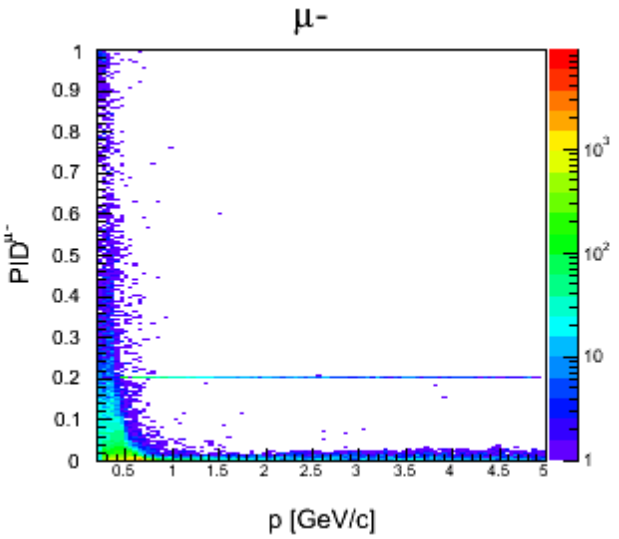
- Global PID for all particles spices ongoing
  - Look into positive particles
  - Understand trend of the disctributions
- Finalize STT dedx description in Classifier using Novosibirsk function
- Including MVD information

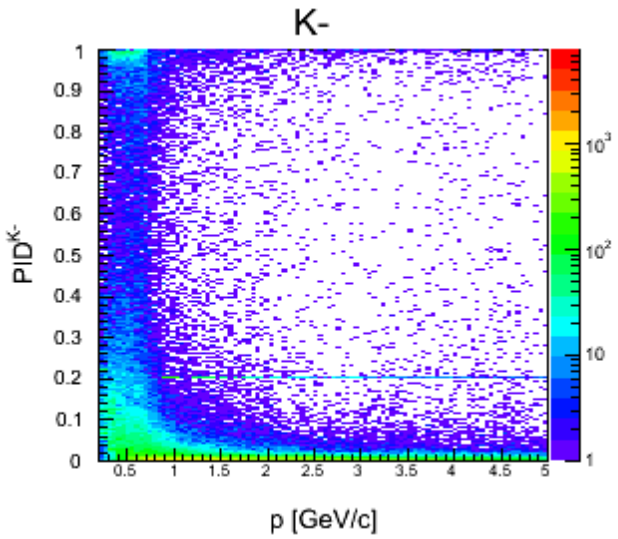
Back-up slides

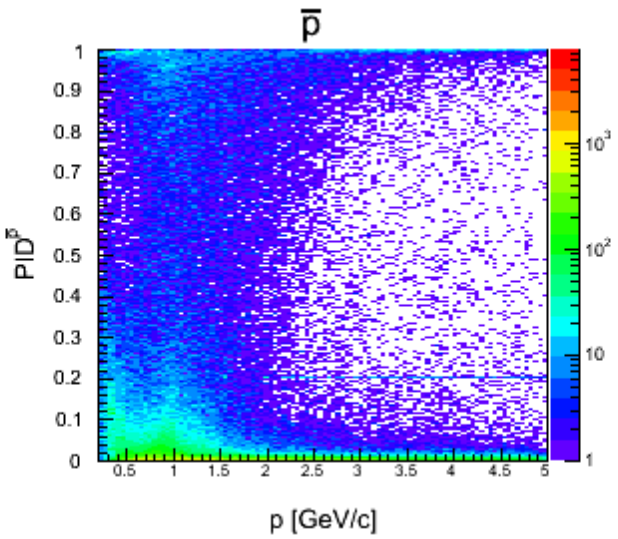
to be an electron





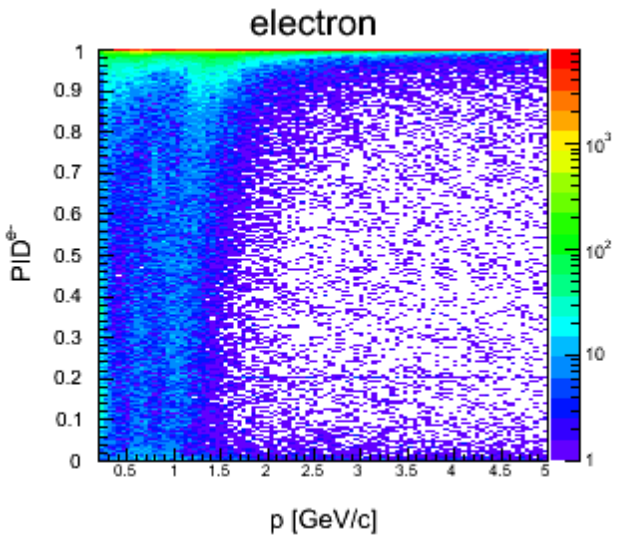


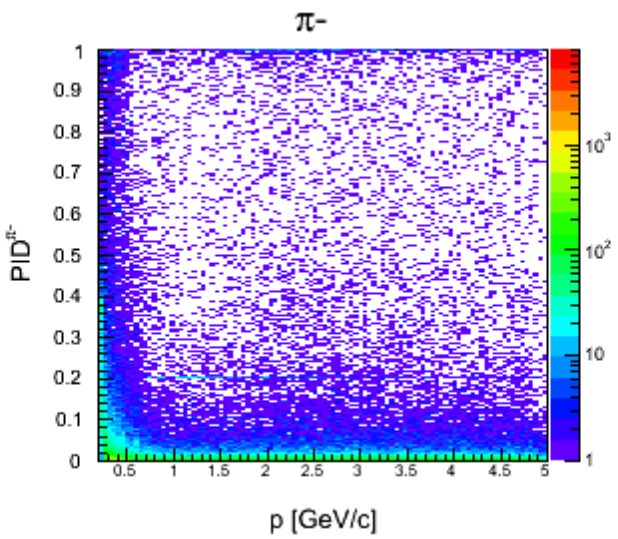


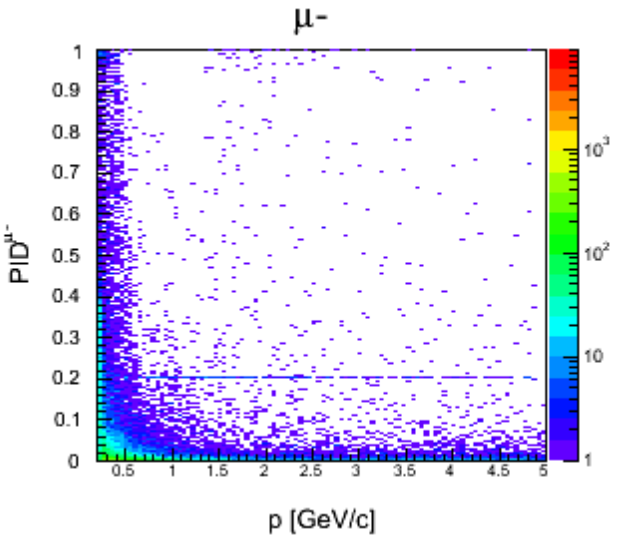


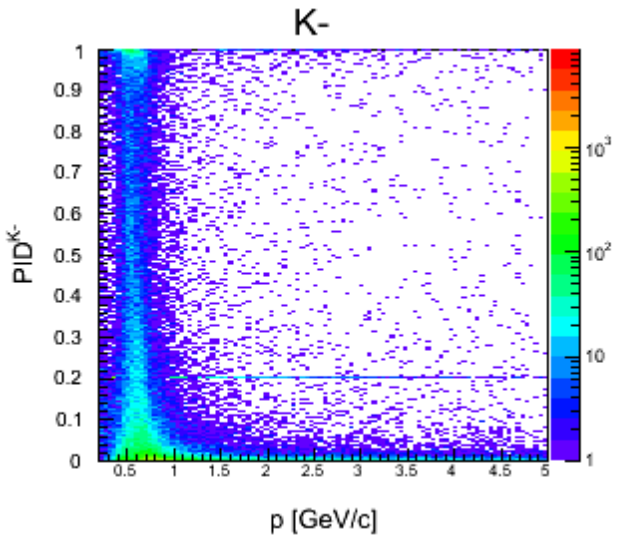
EMC

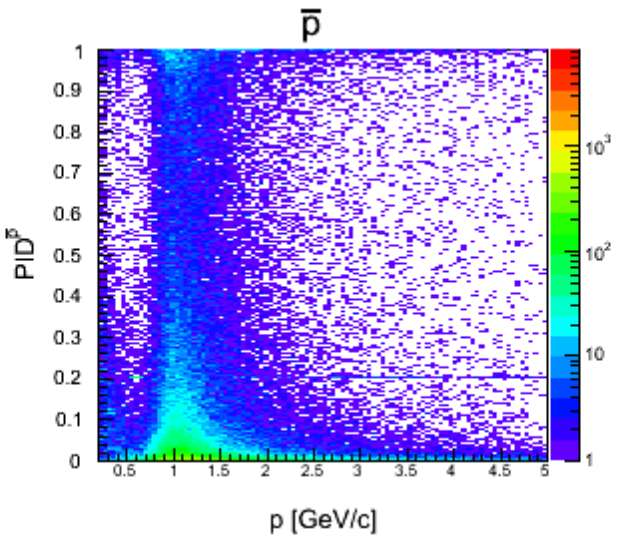
to be an electron





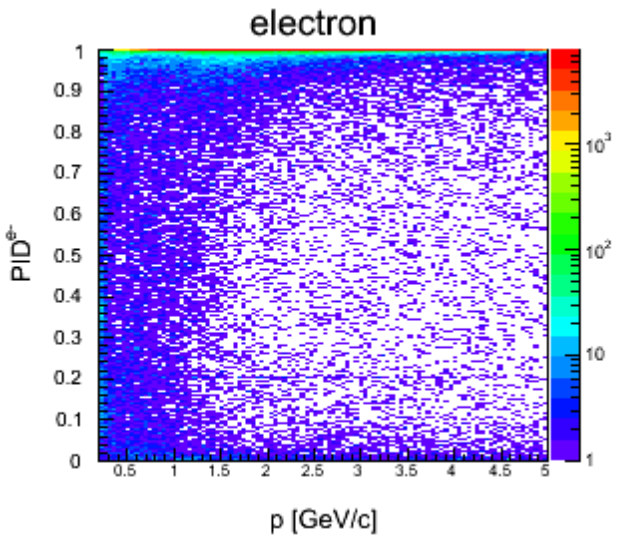


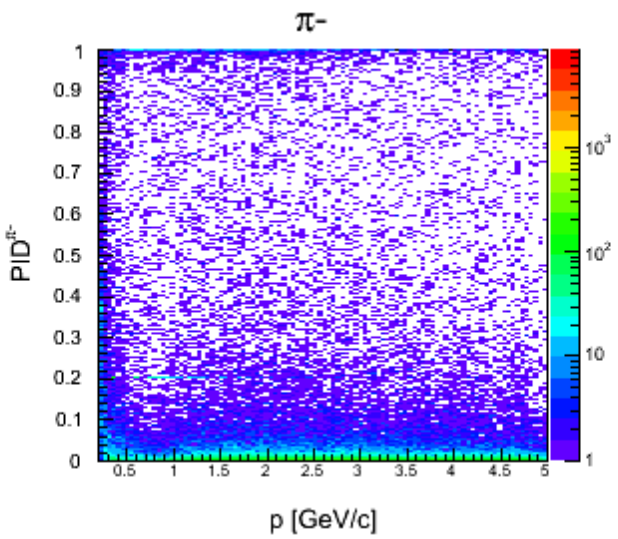


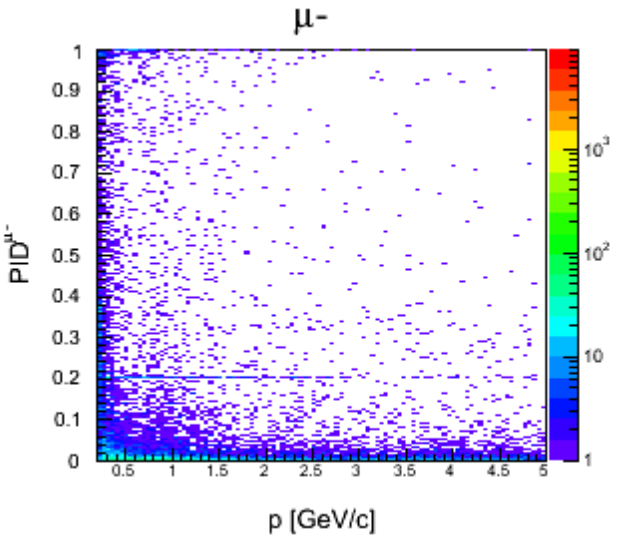


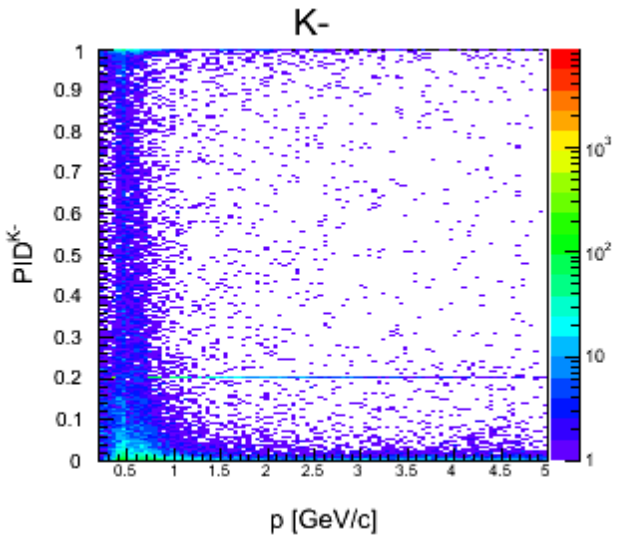
EMC+STT

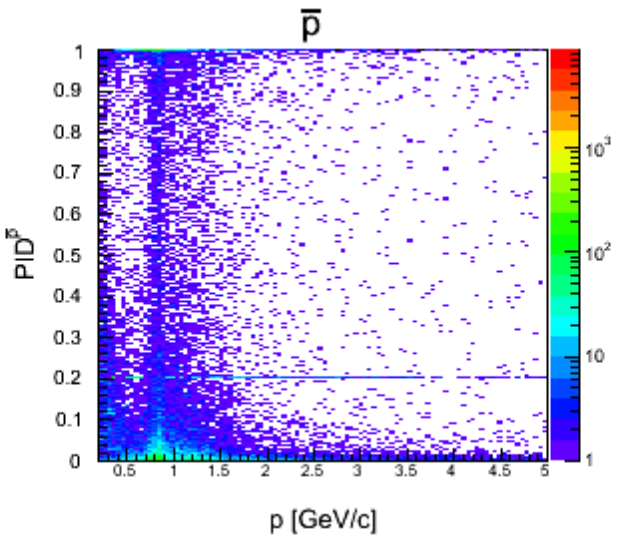
to be an electron





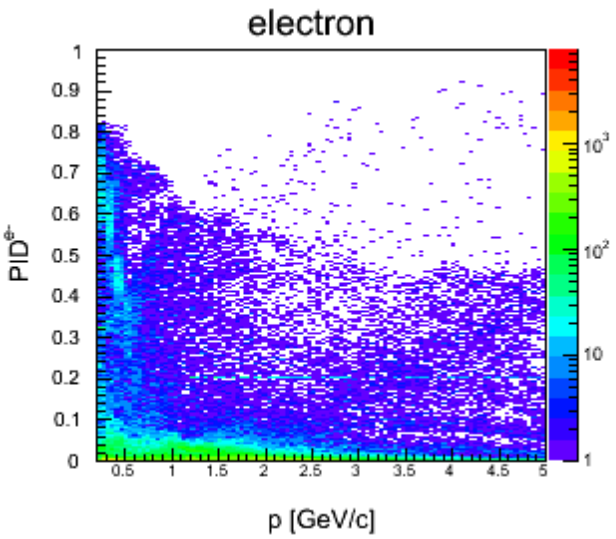


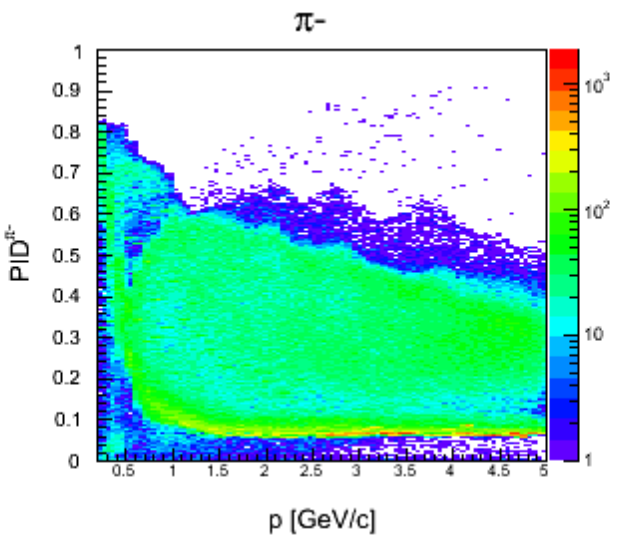


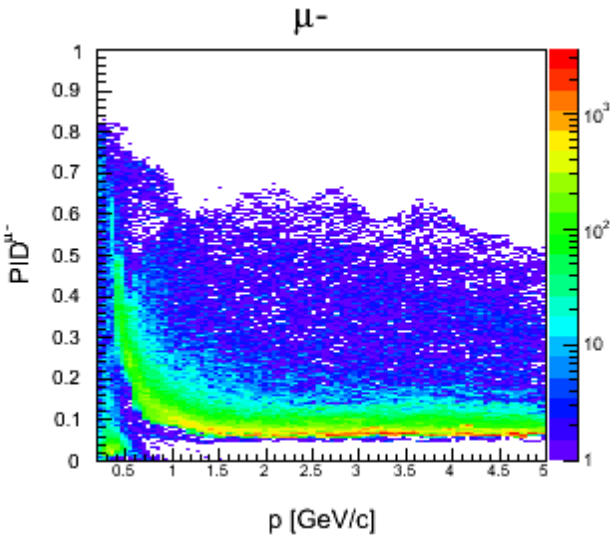


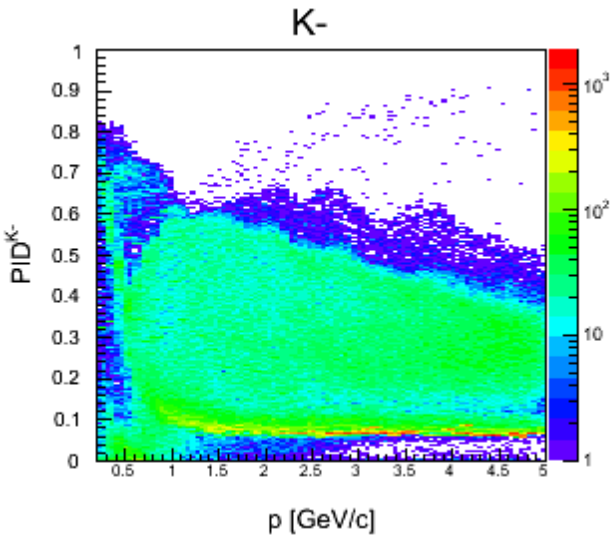
EMC+STT+DRC+DSC

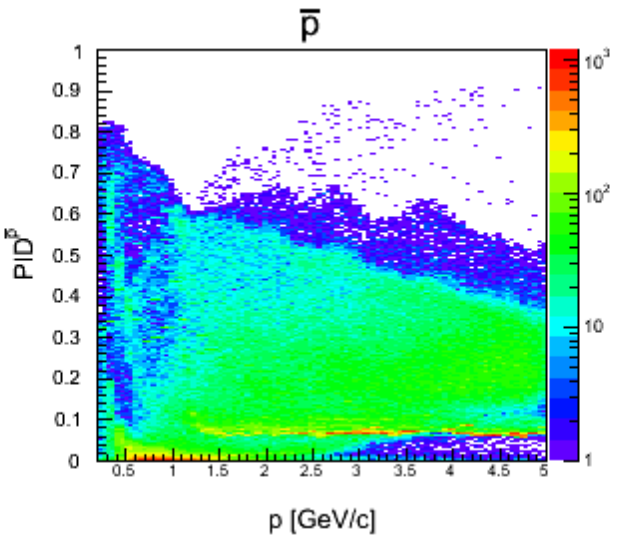
to be pion-





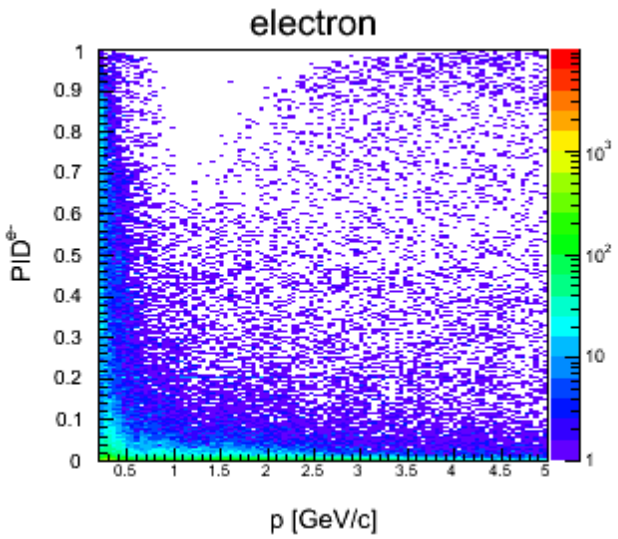


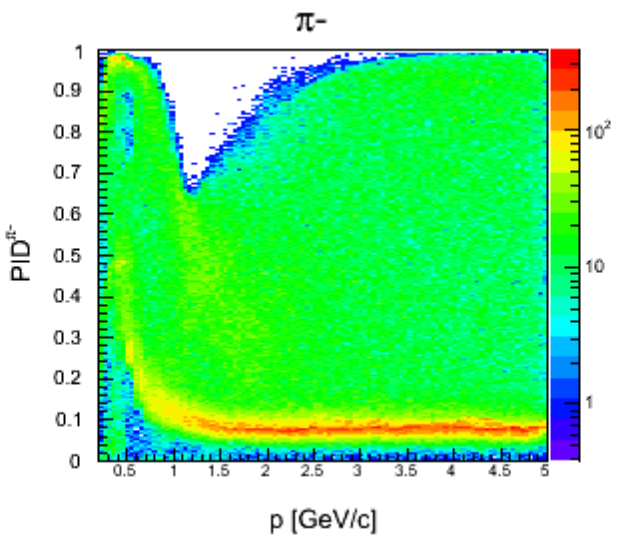


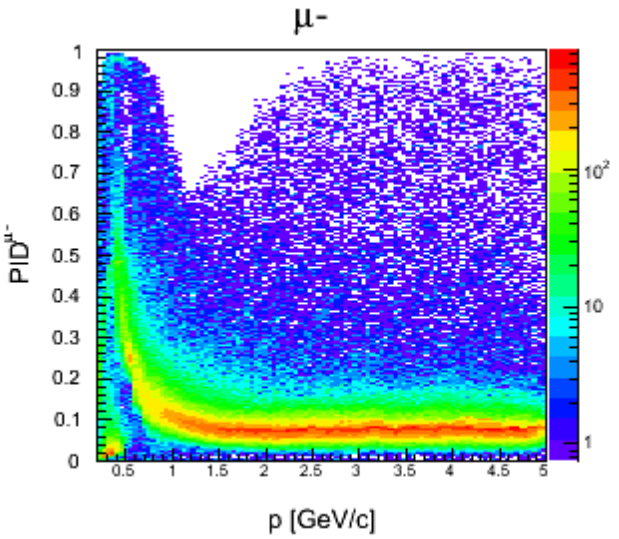


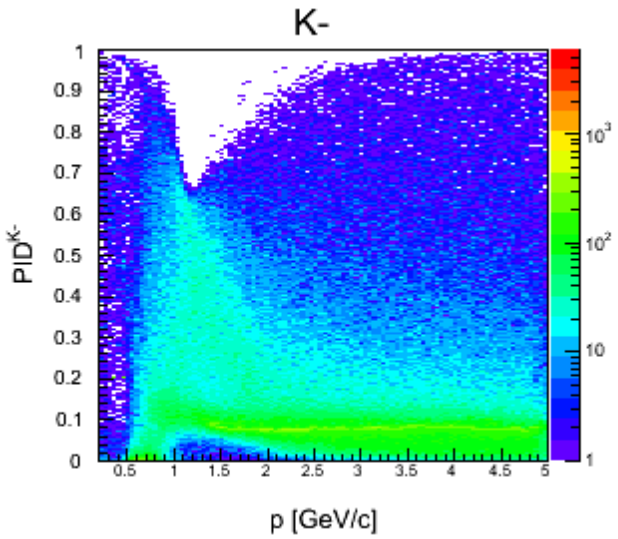
EMC

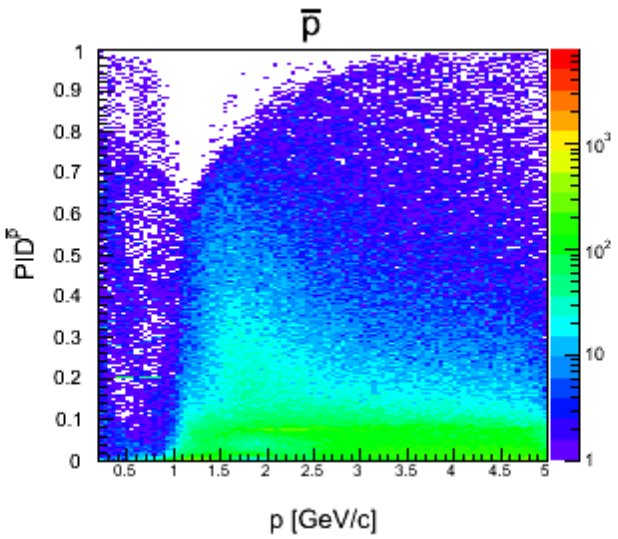
to be pion-





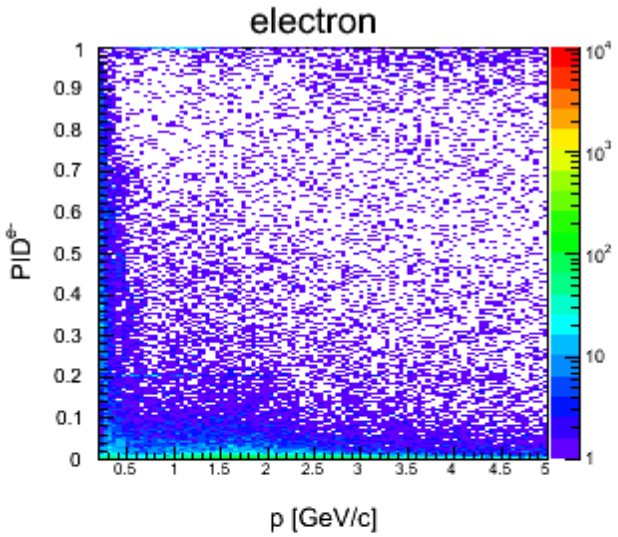


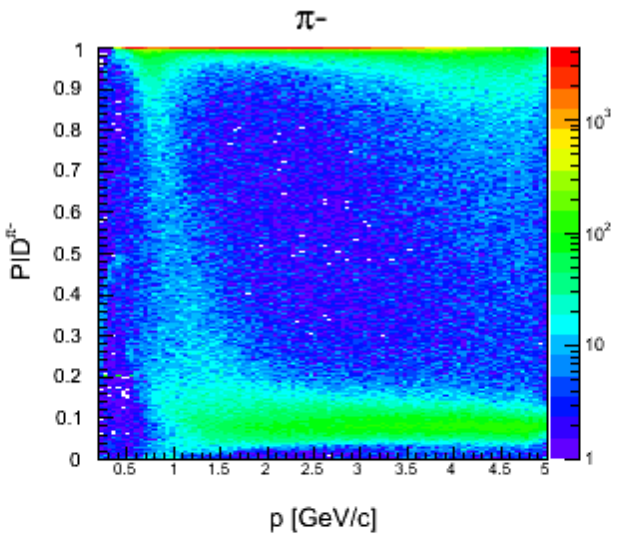


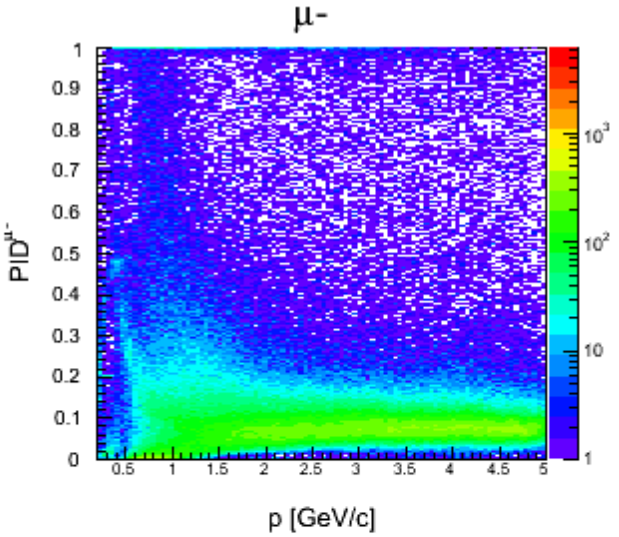


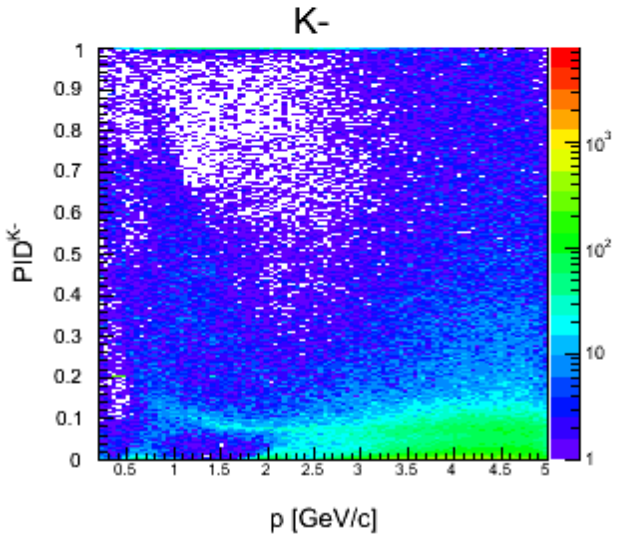
EMC+STT

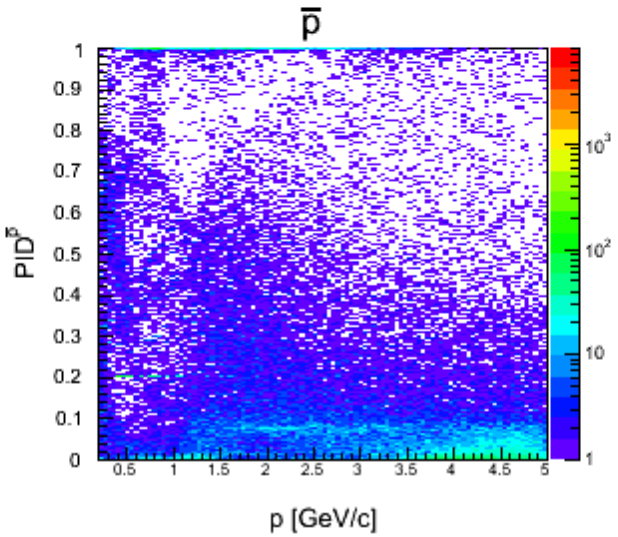
to be pion-





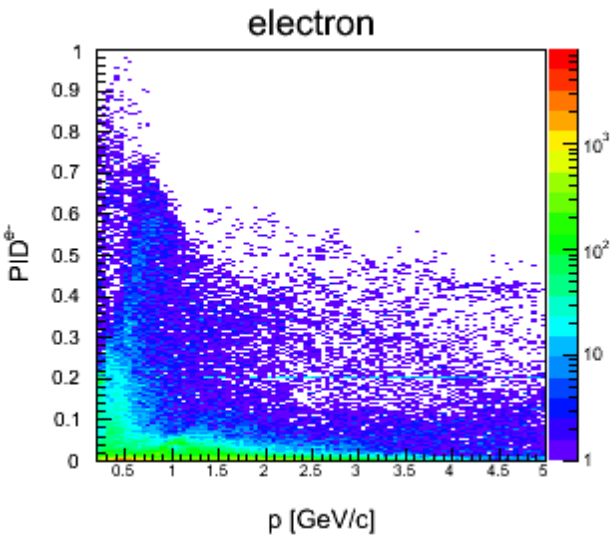


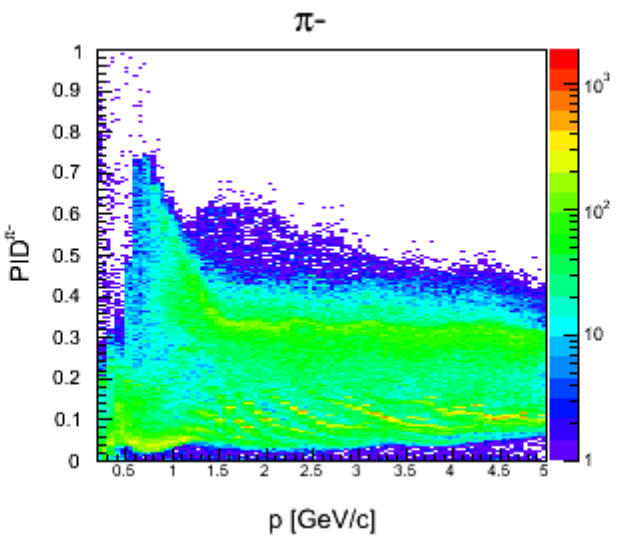


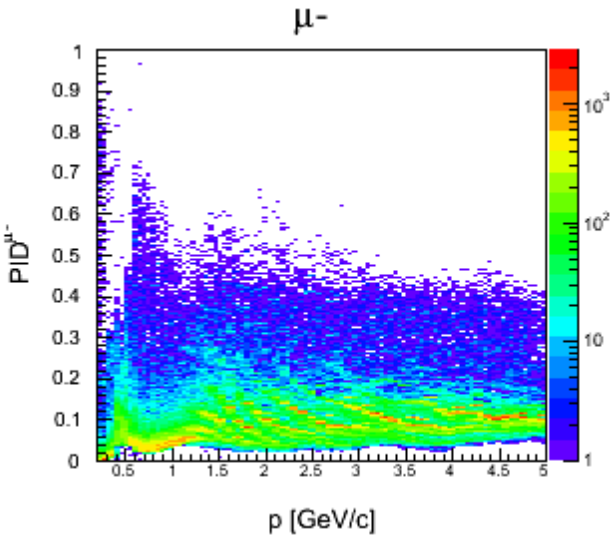


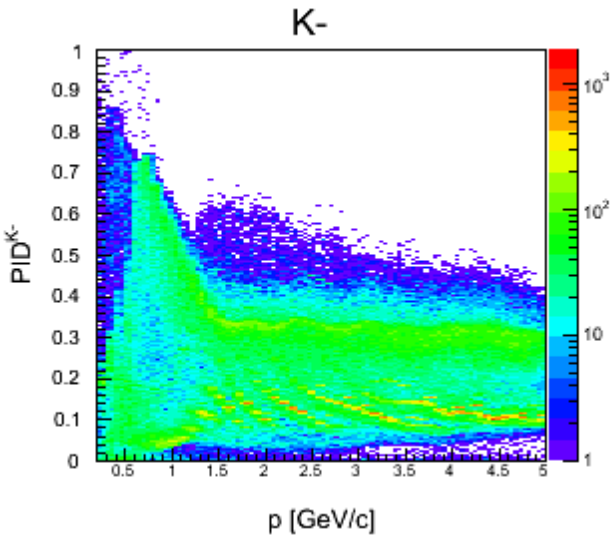
EMC+STT+DRC+DSC

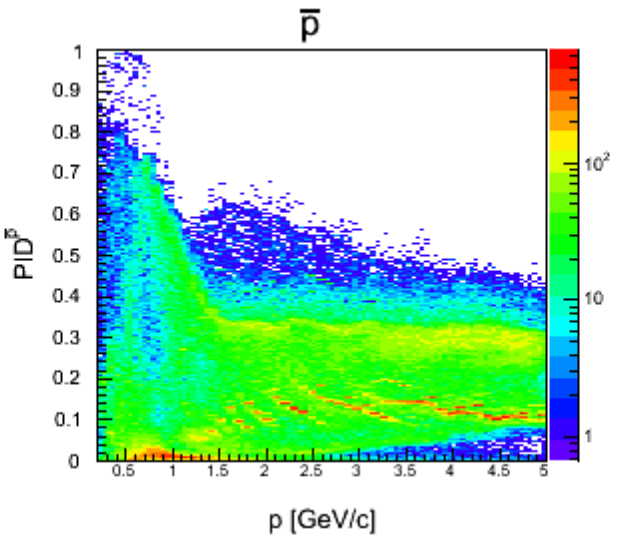
to be kaon-





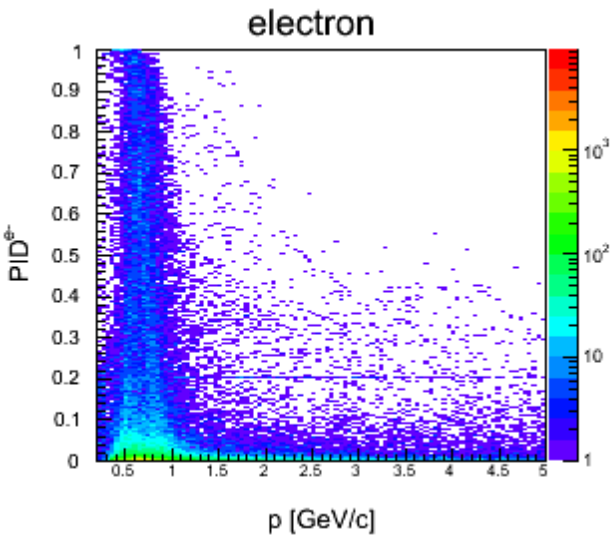


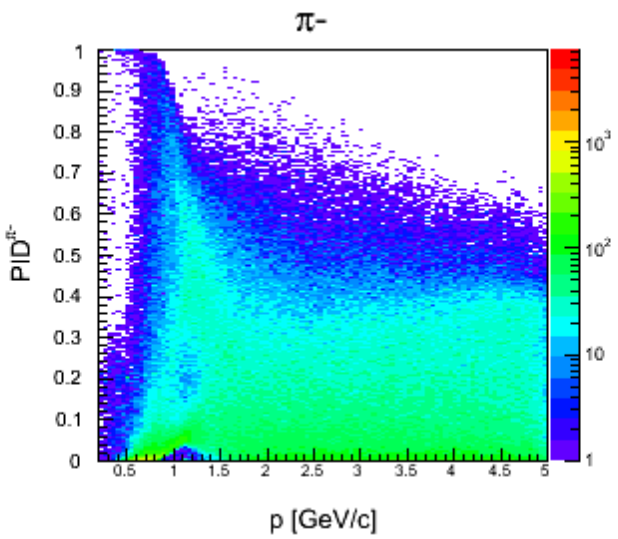


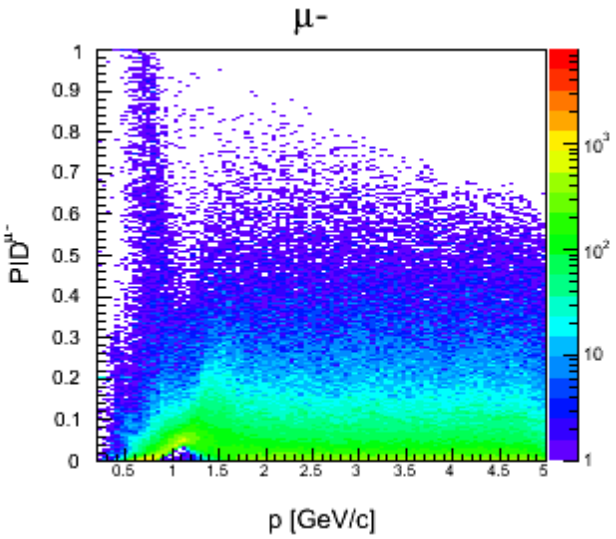


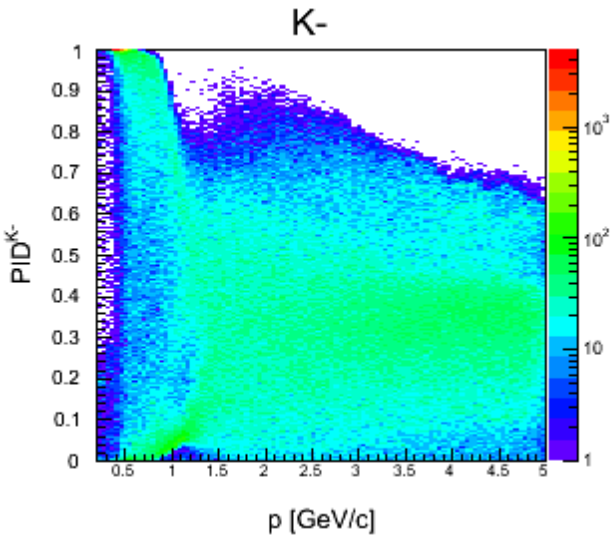
EMC

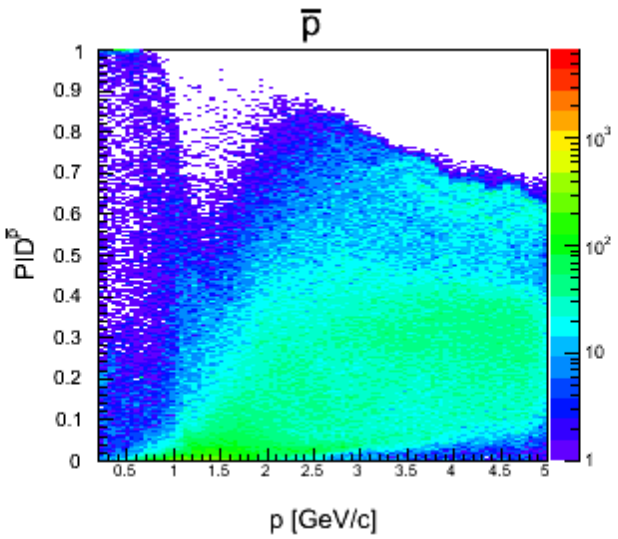
to be kaon-





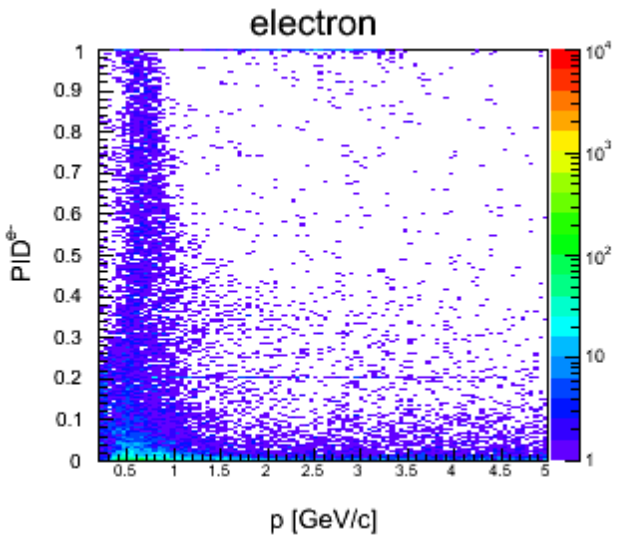


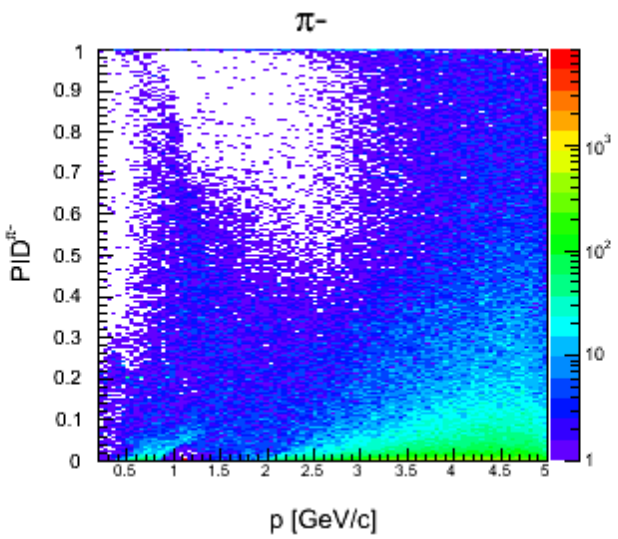


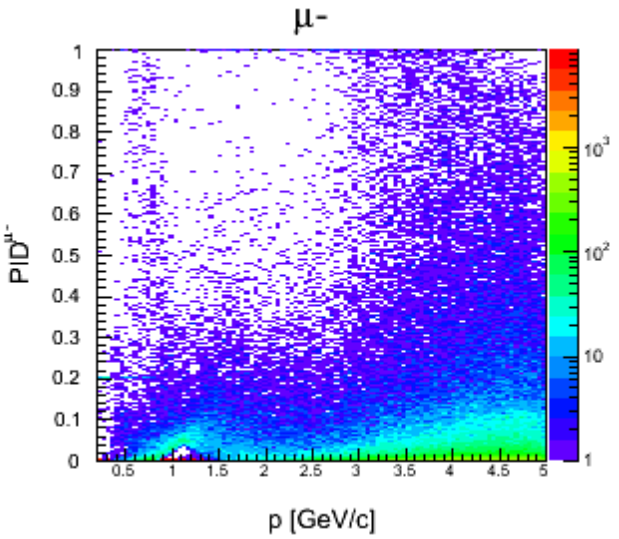


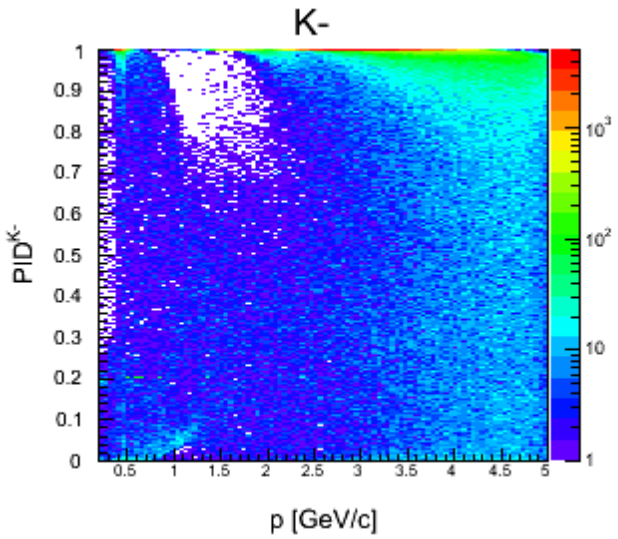
EMC+STT

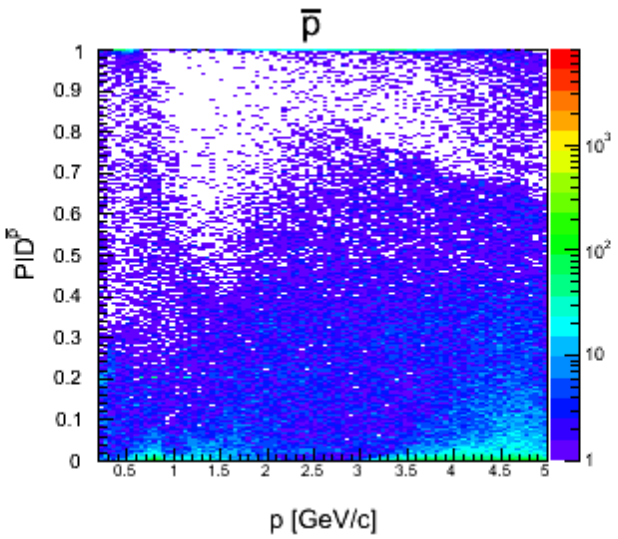
to be kaon-





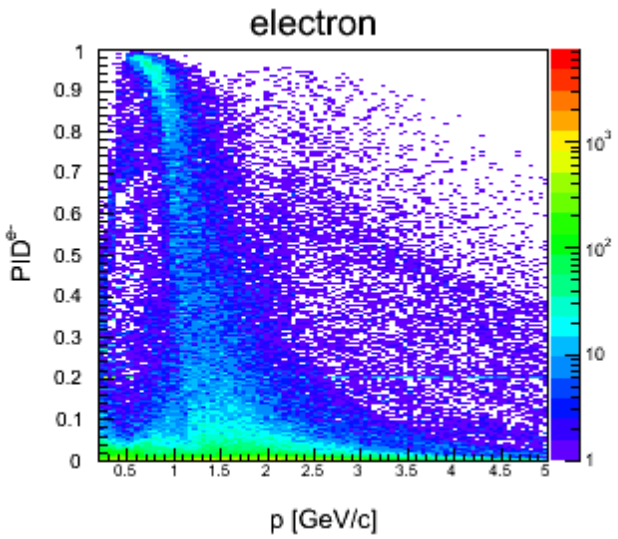


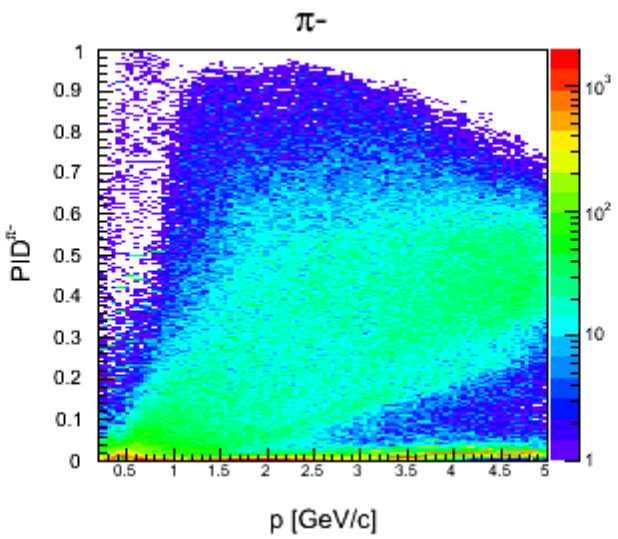


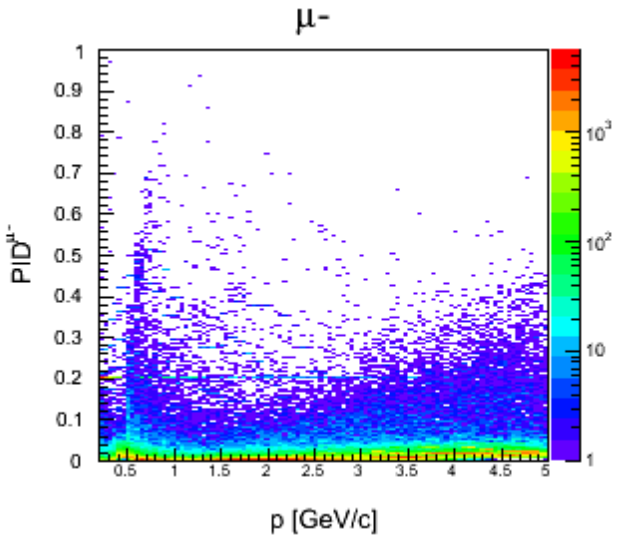


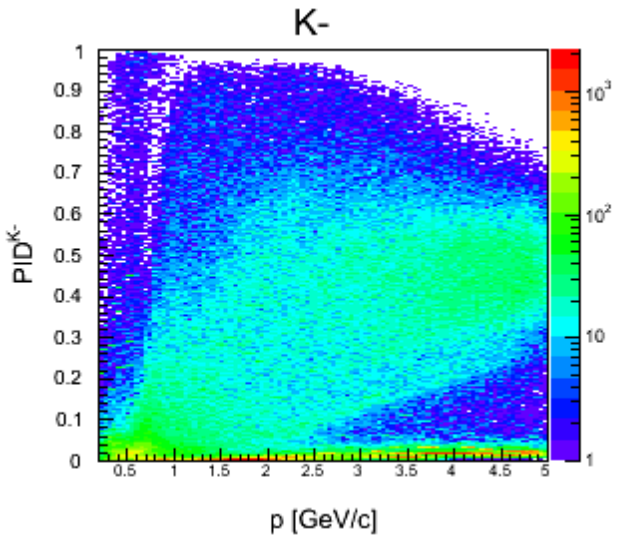
EMC+STT+DRC+DSC

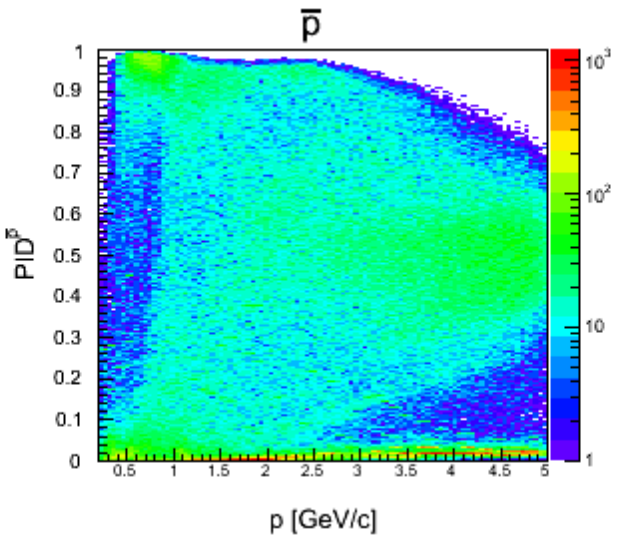
to be anti-proton





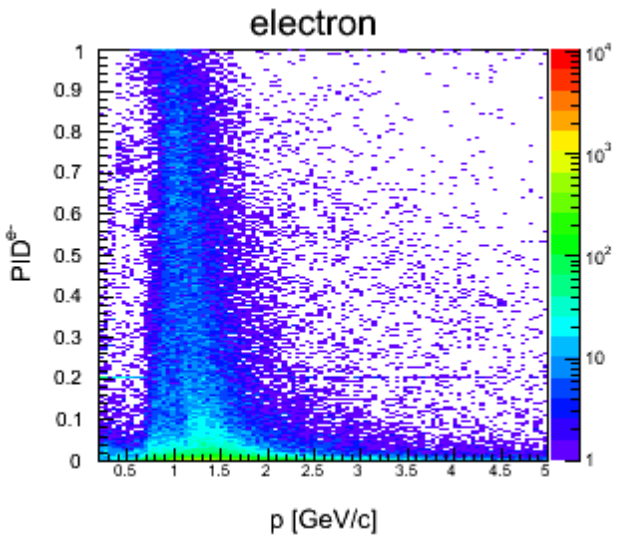


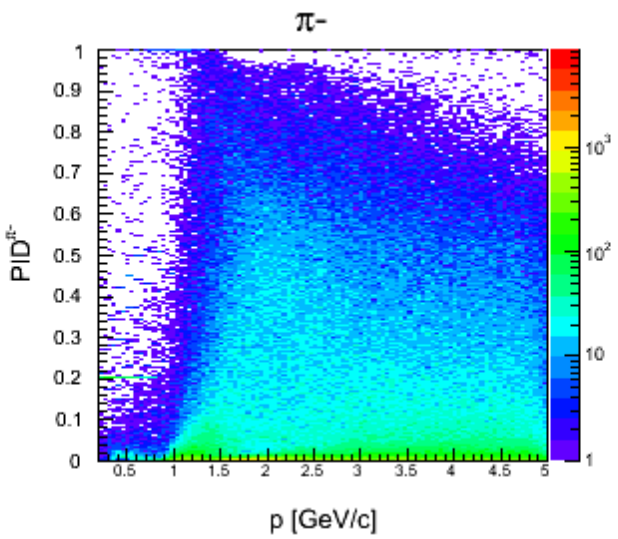


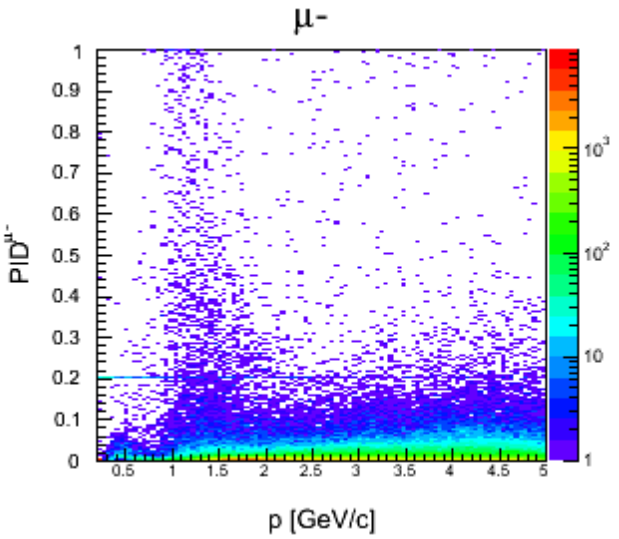


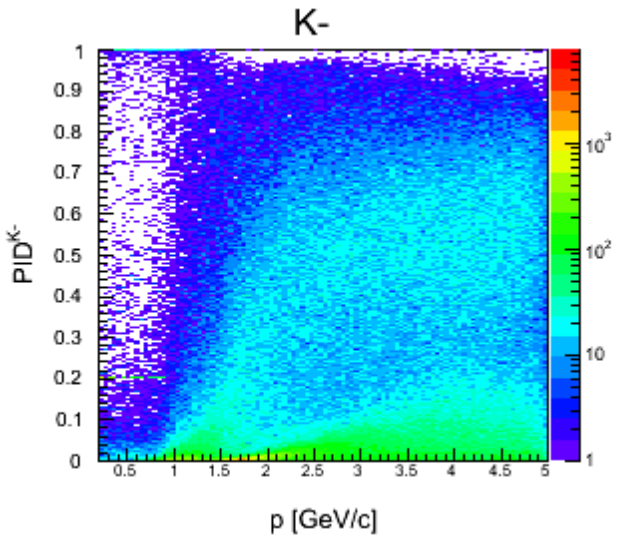
EMC

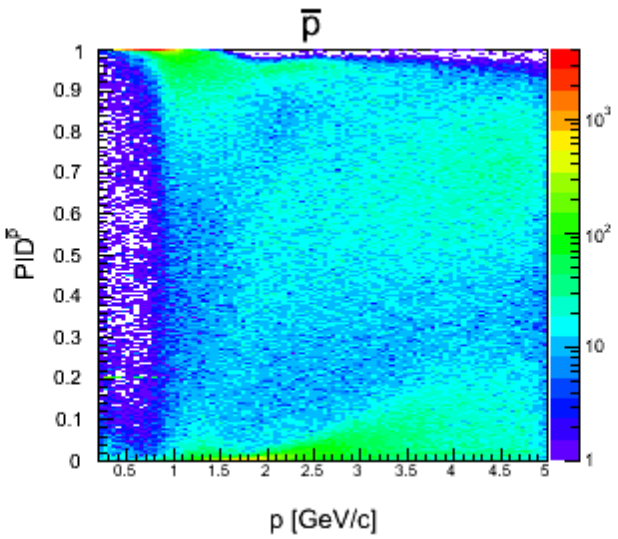
to be anti-proton





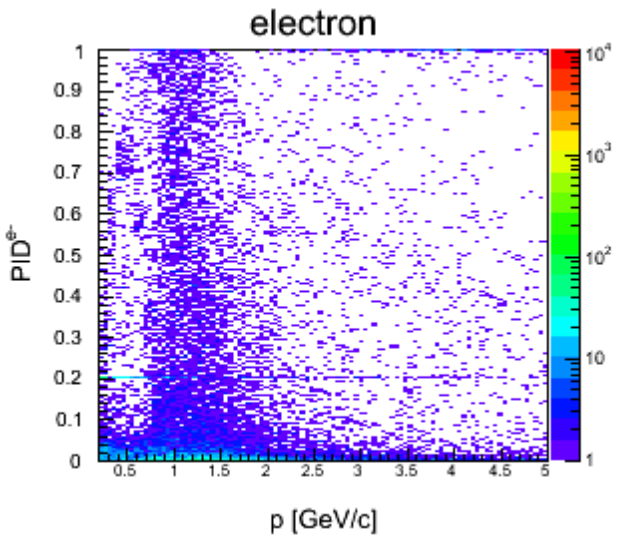


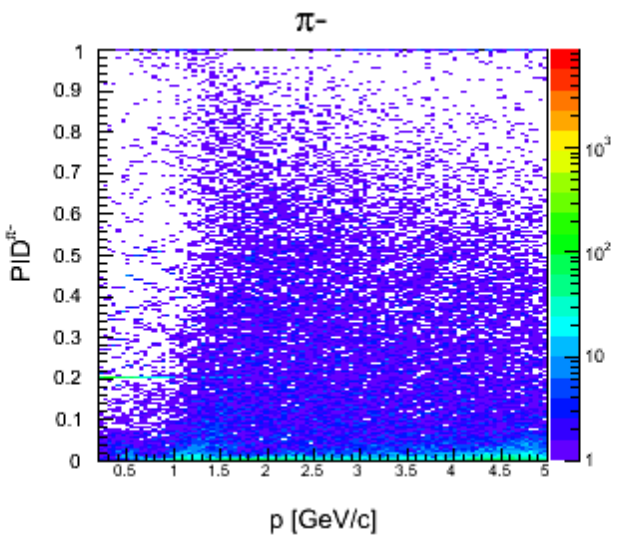


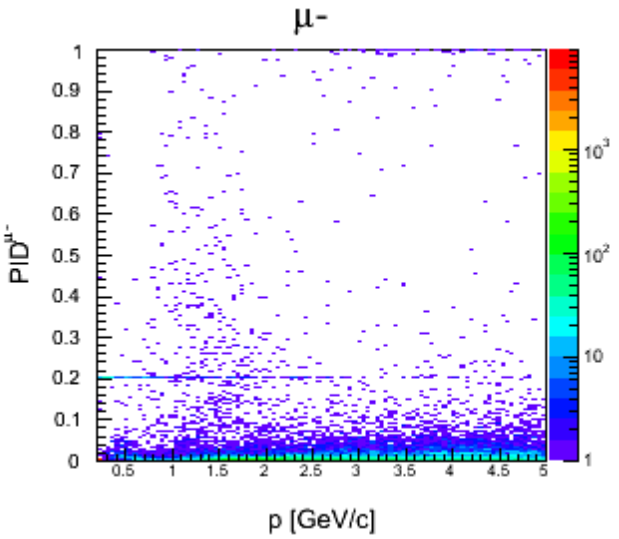


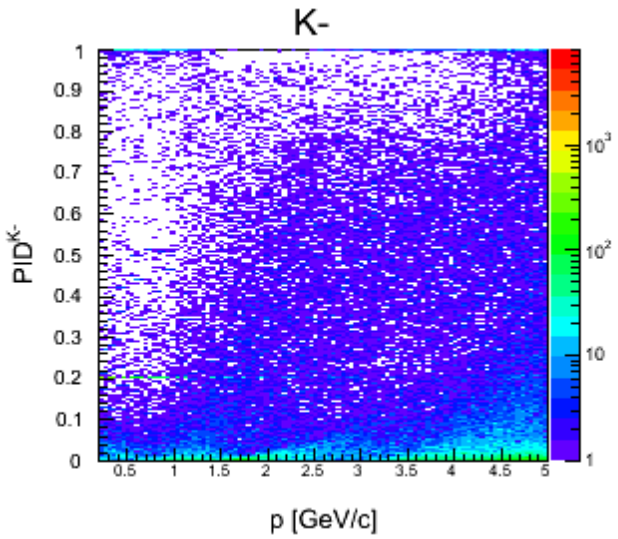
EMC+STT

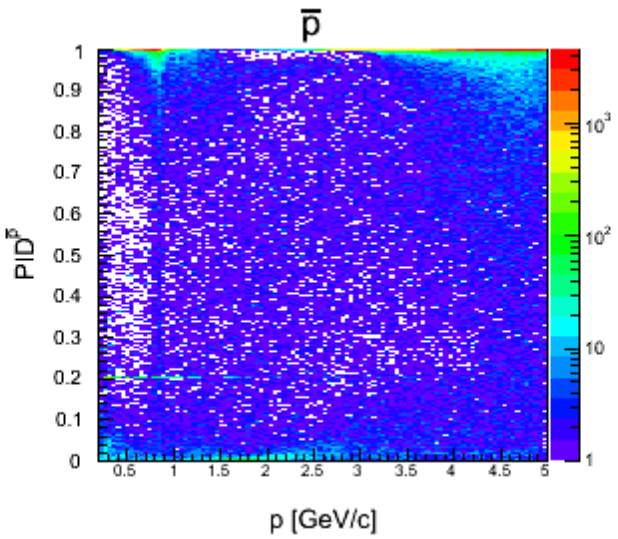
to be anti-proton





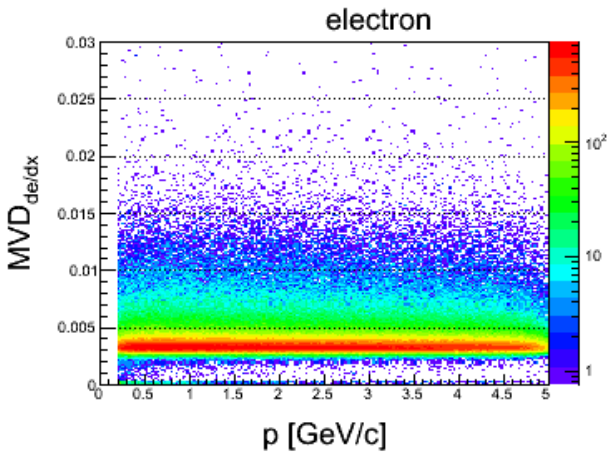


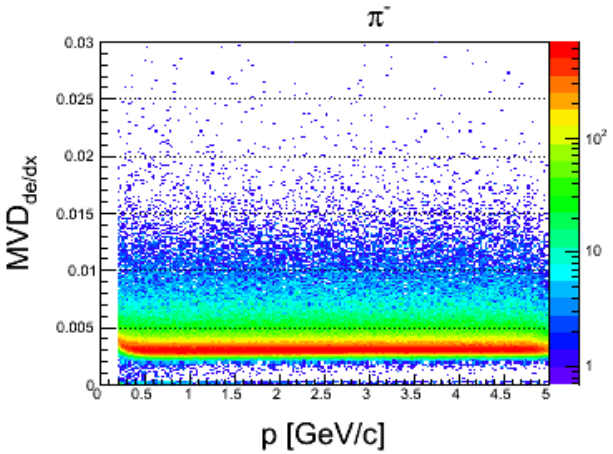


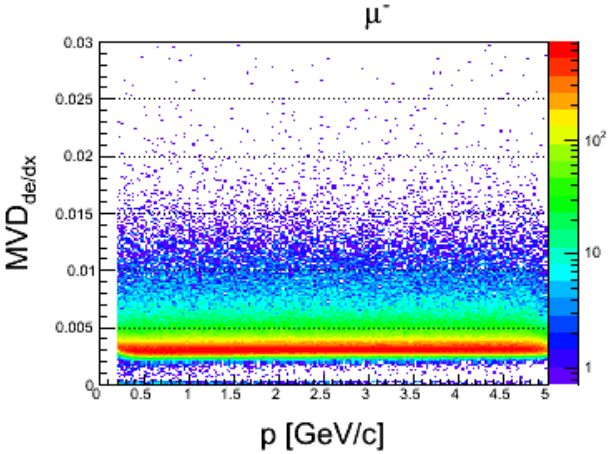


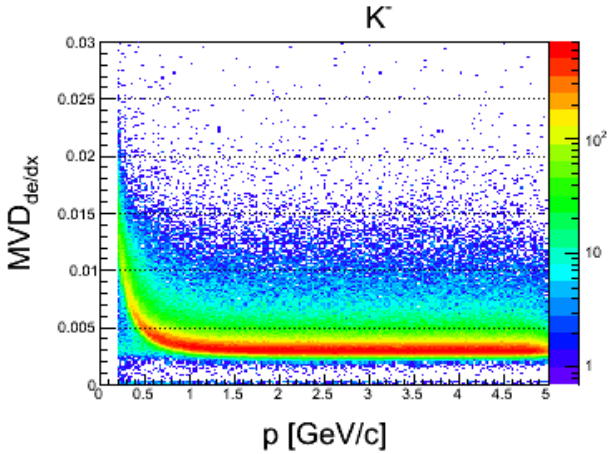
EMC+STT+DRC+DSC

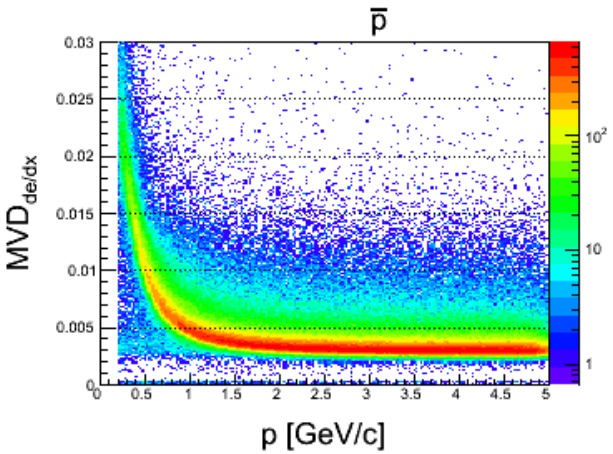
Some spectra from the detectors
MVD dE/dx

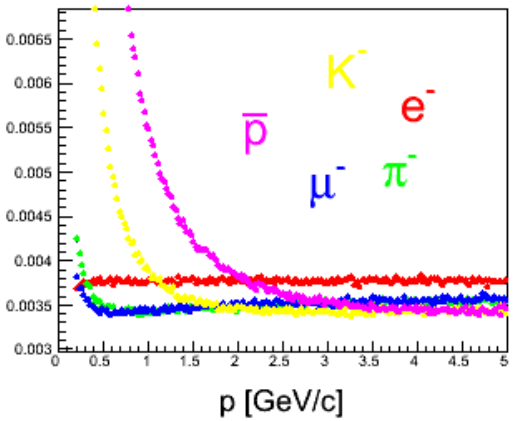












NOT USED IN THIS ANALYSIS