WWU
MÜNSTER

Update on e+e− analysis with PAPA

PWG Meeting

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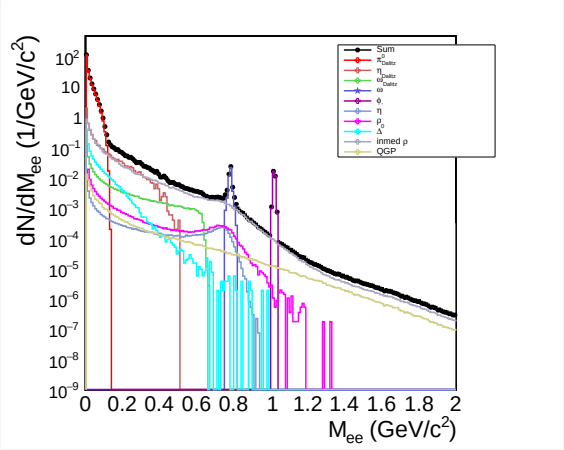
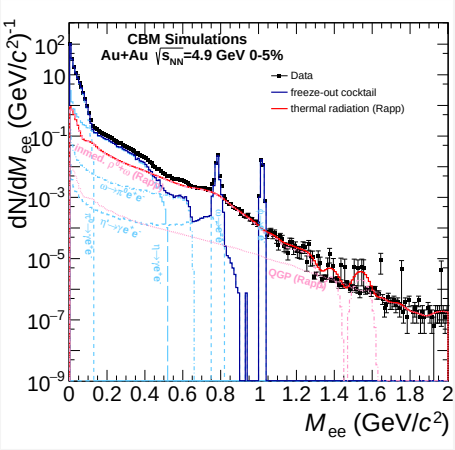
living.knowledge

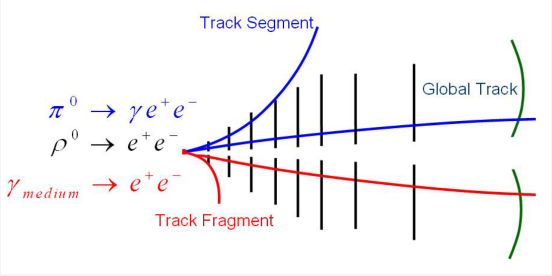
Bundesministerium
für Bildung
und Forschung

Re-Check Input Cocktail





Cuts on Conversion Electrons



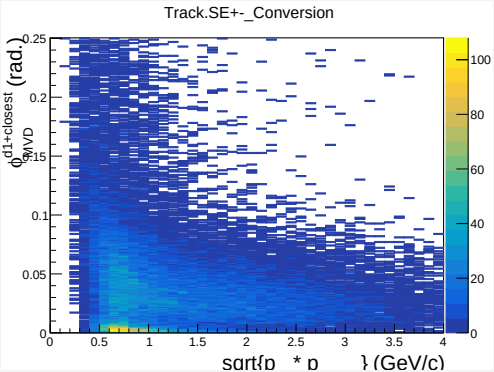
Taken from Tetyanas Phd Thesis

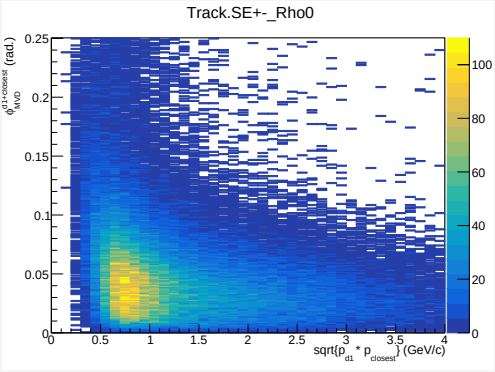
Track Fragment: Not tracked
Track Segment: Tracked, but not identified
Global Track: Fully identified

How to reject e+e− from γ conversion:

- If both decay partners are fully identified:
  $\Rightarrow$ Use pair cut
- If not:
  $\Rightarrow$ Pair global track with closest track segment and cut

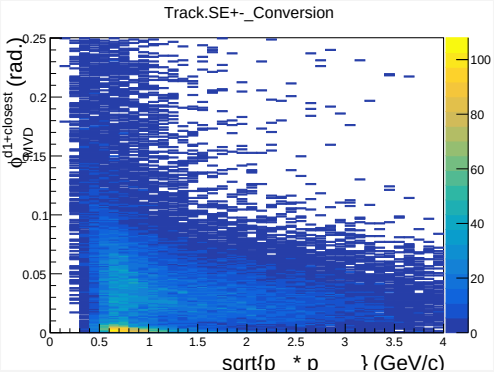
Cuts on Conversion Electrons

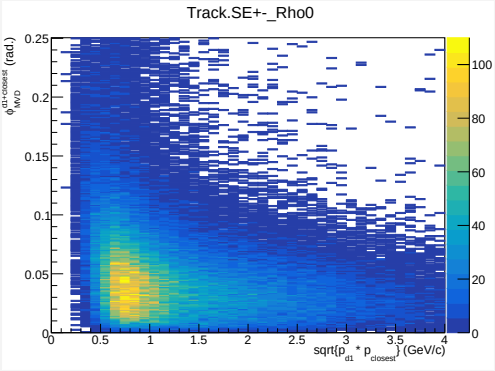




- Pair global track with closest track segment
- Plot opening angle ϕ vs $\sqrt{p_1 \cdot p_2}$

Cuts on Conversion Electrons

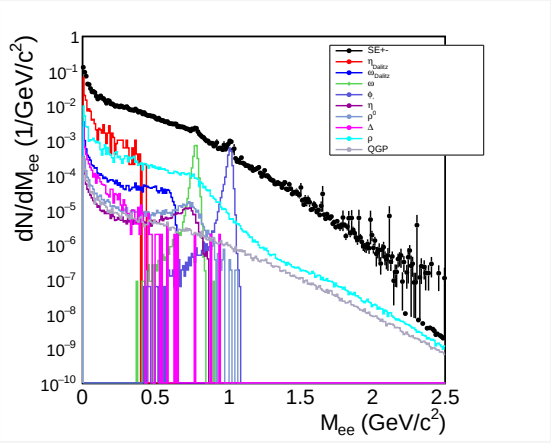


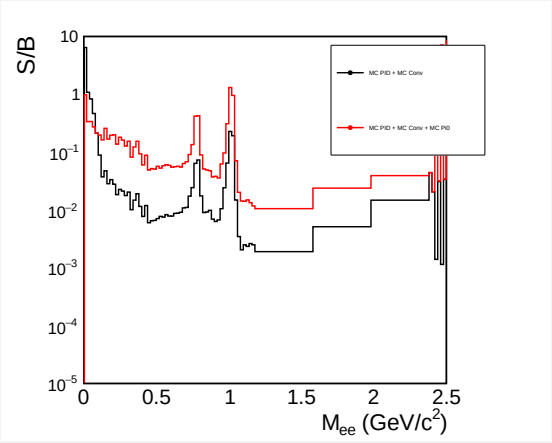


- Separation visible, but only $\sim$ 10 % of conv. tracks are in the clearly separated zone
- What are the "theoretical" expectations? $\Rightarrow$ check with MC info!

Nr of Fragments, Segments and Global Tracks

Best Case Scenarios



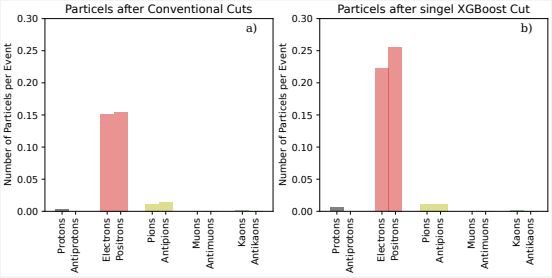


- π_0 dalitz decays main source of combinatorial background

Some results from Henrik

- Reminder: Henrik used ML methods (mainly XGBoost) for classification of electron tracks
- Two versions:
  - a Classifier which only uses RICH data as input
    ⇒ Comparison to currently used RICH ANN possible
  - b Classifier which uses data from all detectors as input
    ⇒ Comparison to my current conventional cut settings
- Henrik is on vacation at the moment but will give a talk at the collaboration meeting!

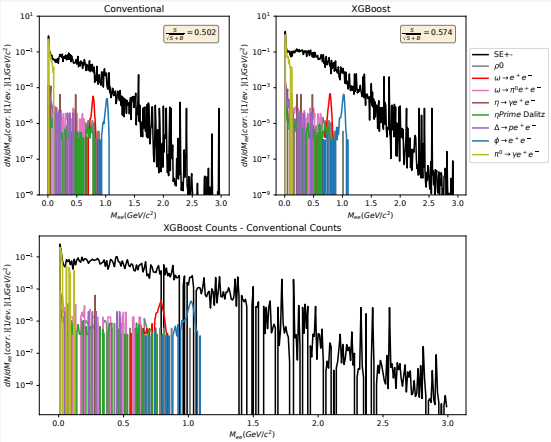
Some results from Henrik



Taken from Henriks Master Thesis

- Promising results with ML Classifier using all detector data
- $\sim$ 30 % higher electron efficiency reached, at the same purity as with conventional cuts

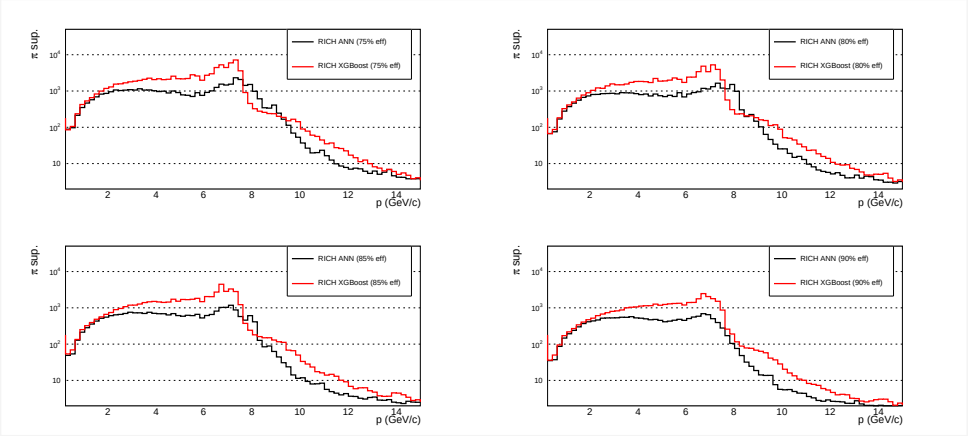
Some results from Henrik



Taken from Henriks Master Thesis

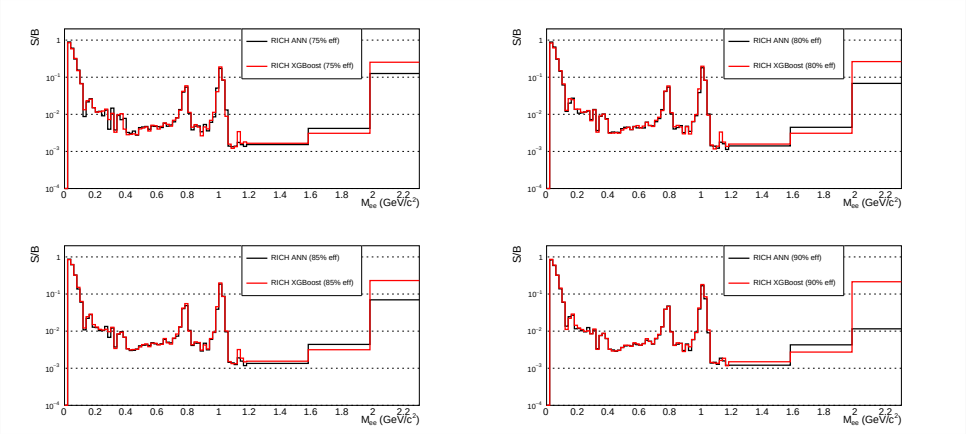
- Not tested in a full pair analysis with sufficient statistics yet
  ⇒ To be done (by me) soon!

Test of Henriks RICH ML Classifier



- RICH XGBoost classifier has higher pion supression for almost all cases

Test of Henriks RICH ML Classifier



- S/B ratios similar, Pion sup. quite high, most comb. background comes from π_0 dalitz

Documentation

- Henrik and I wrote a documentation about how he trained the classifiers: http://trd.gitpages.cbm.gsi.de/cbmtrd-software-guide/MLcbm/MLCBM.html
- Useful for other people who want to use machine learning for cbm data
  $\Rightarrow$ not only dielectron/dilepton people