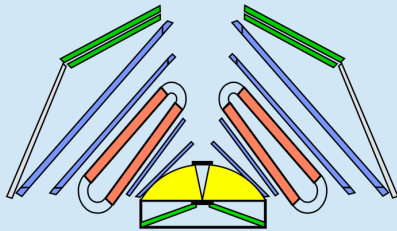
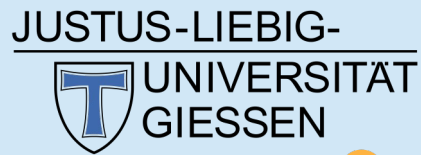


# Update on the dilepton analysis in p+p at 1.58 GeV



Karina Scharmman, JLU Gießen

VIII HADES physics analysis meeting  
Jun 22, 2026

Contact: [karina.scharmman@physik.uni-giessen.de](mailto:karina.scharmman@physik.uni-giessen.de)

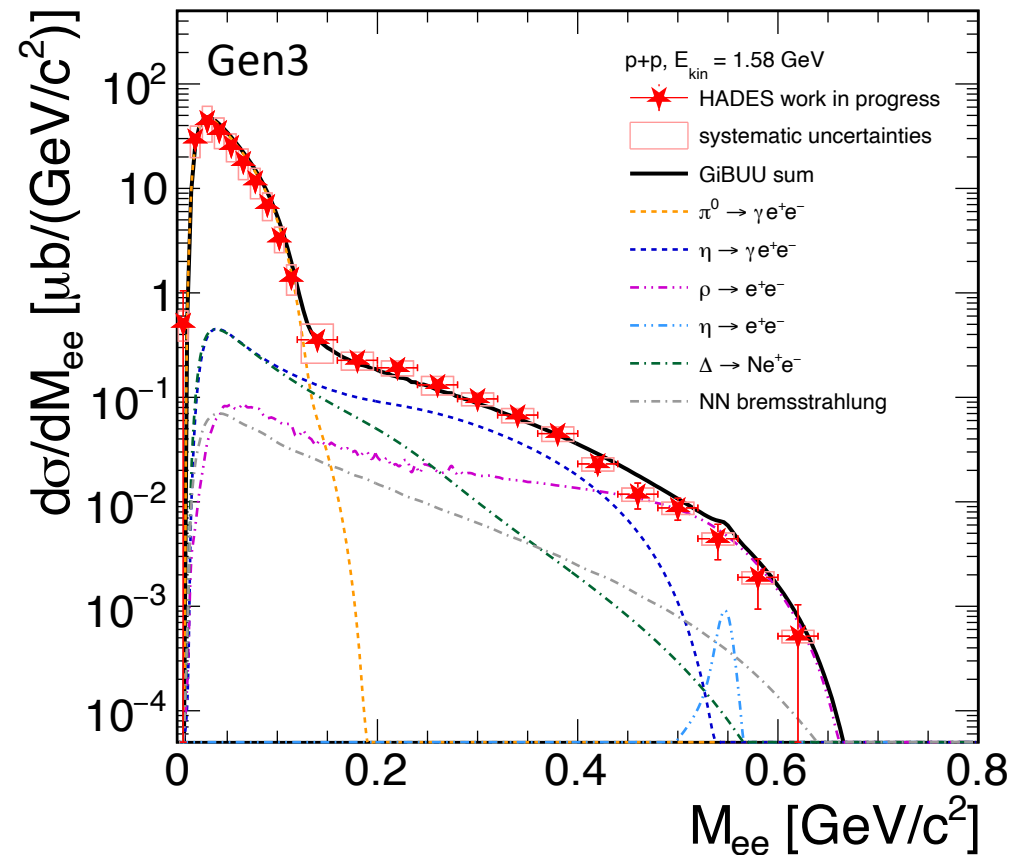
# Reminder: Status in Feb 2026

## Summary:

- Final analysis results for Gen3
- First comparisons to Gen4Test

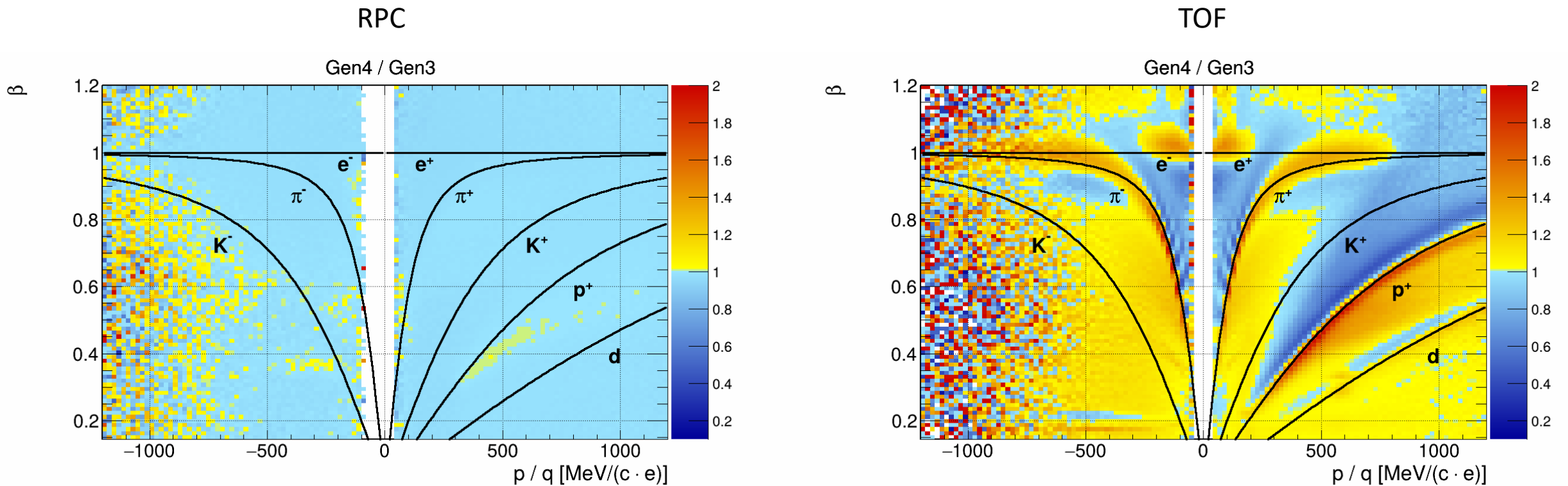
## ToDos:

- Paper proposal writing
- Rerun of the analysis with Gen4
- Documentation

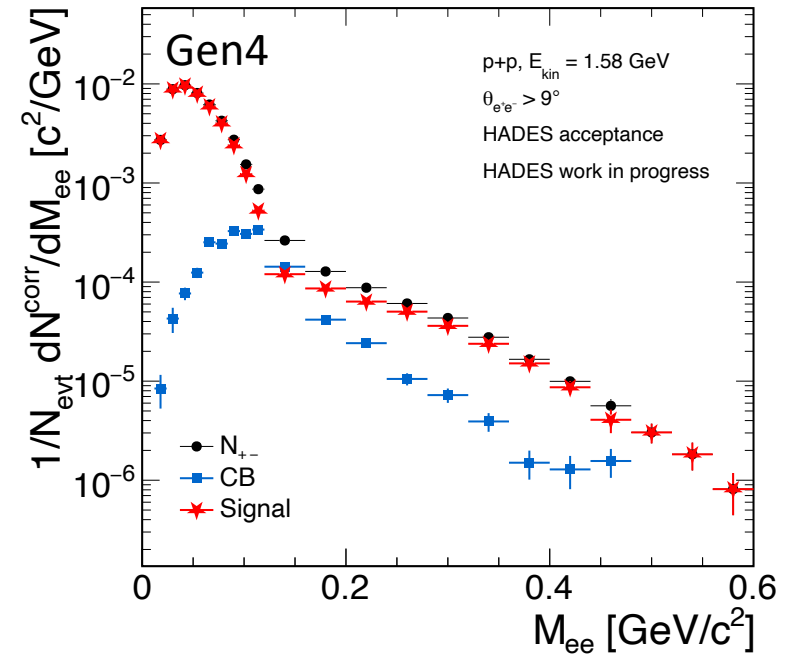
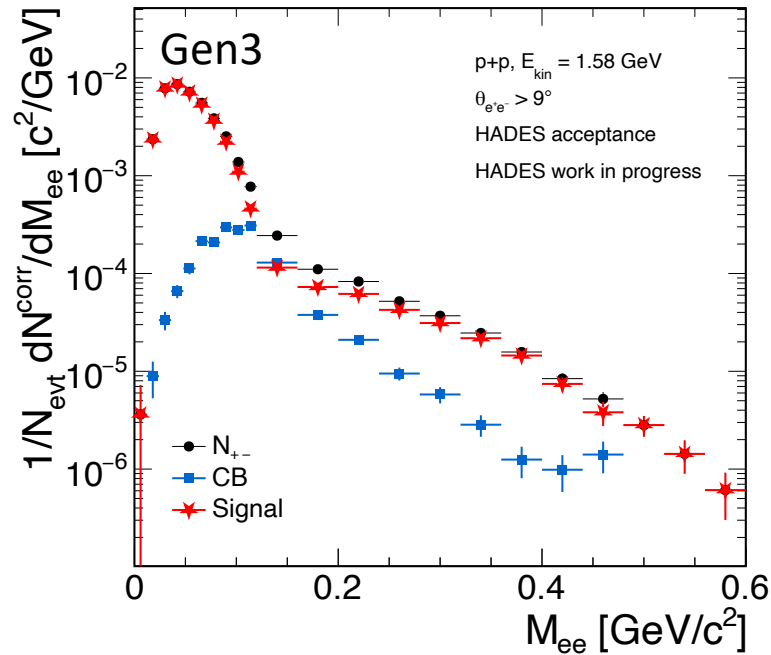


# Comparison of Gen3 and Gen4

Improvement in TOF resolution increases lepton yield in Gen4 (after  $\beta$  cut):



# Comparison of Gen3 and Gen4



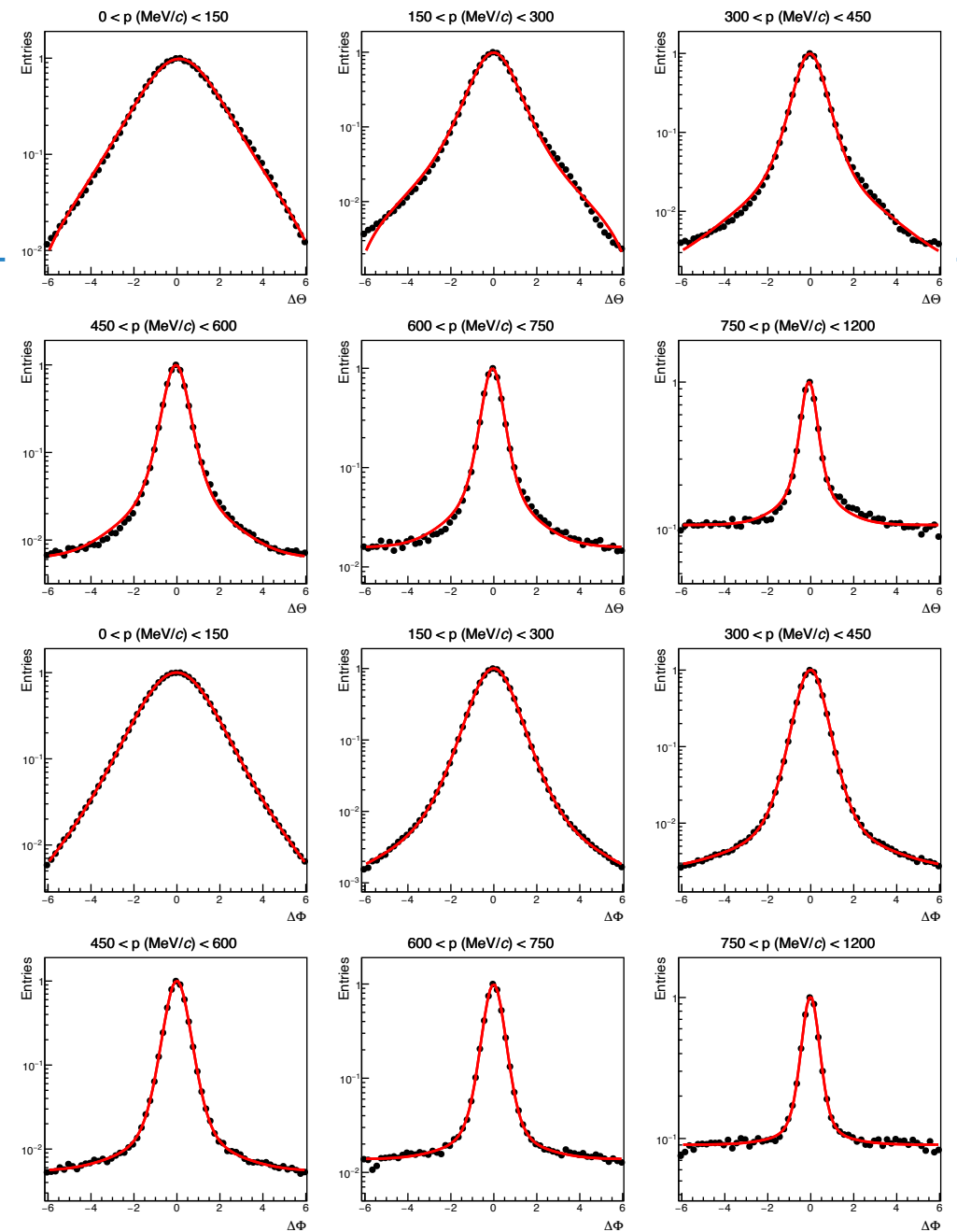
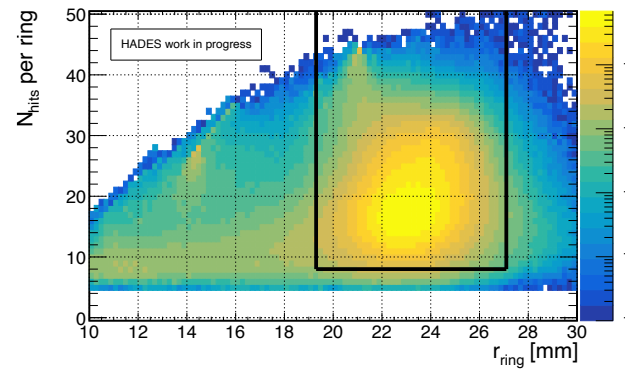
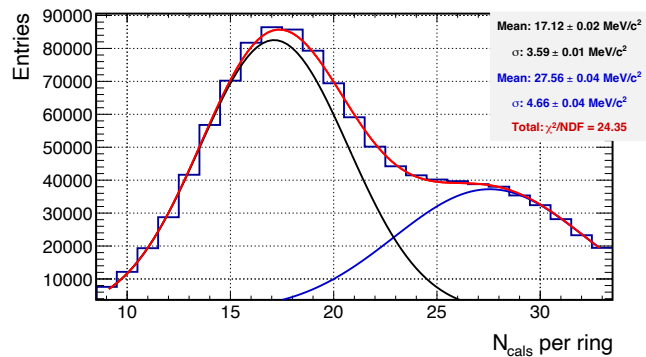
$M_{ee}$	$\leq 0.140 \text{ GeV}/c^2$	$> 0.140 \text{ GeV}/c^2$
$N_{pairs, raw}$	48 842	1 639
$N_{pairs, ax\epsilon corr}$	186 651	4 575

$M_{ee}$	$\leq 0.140 \text{ GeV}/c^2$	$> 0.140 \text{ GeV}/c^2$
$N_{pairs, raw}$	56 800 (+ 16 %)	1 853 (+13 %)
$N_{pairs, ax\epsilon corr}$	216 215 (+ 16 %)	5 215 (+ 14 %)

# New results for Gen4!

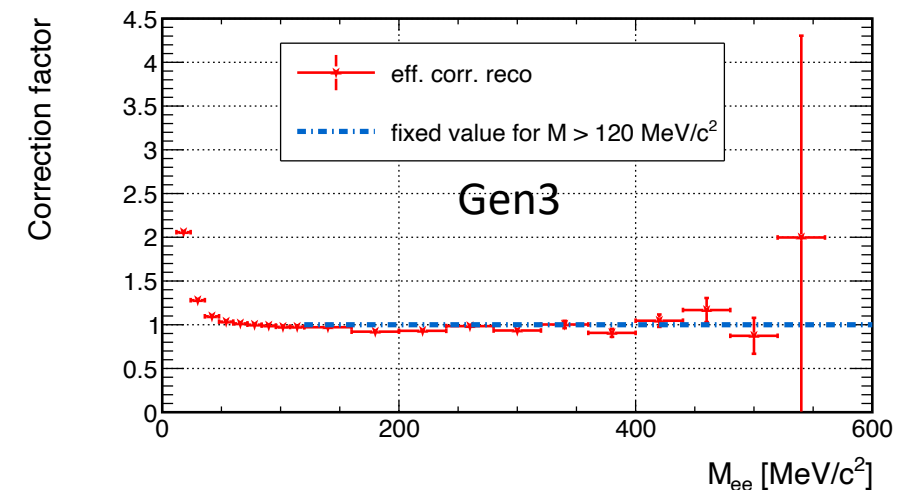
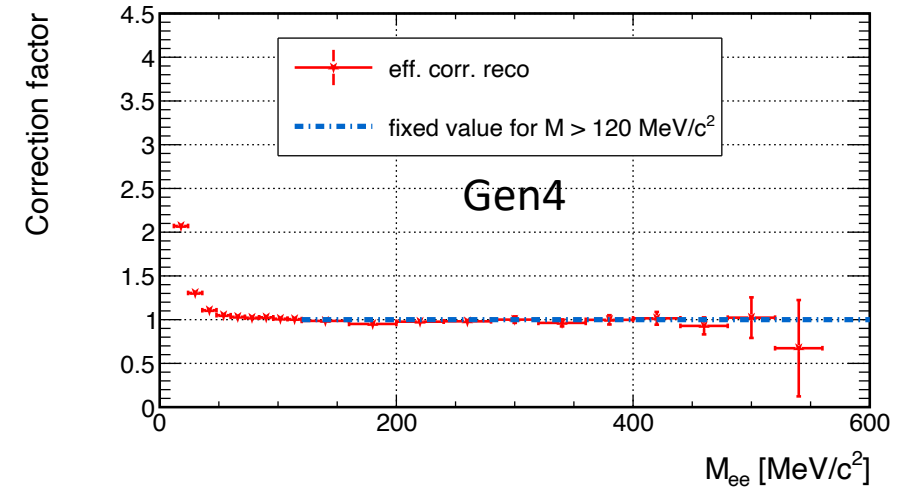
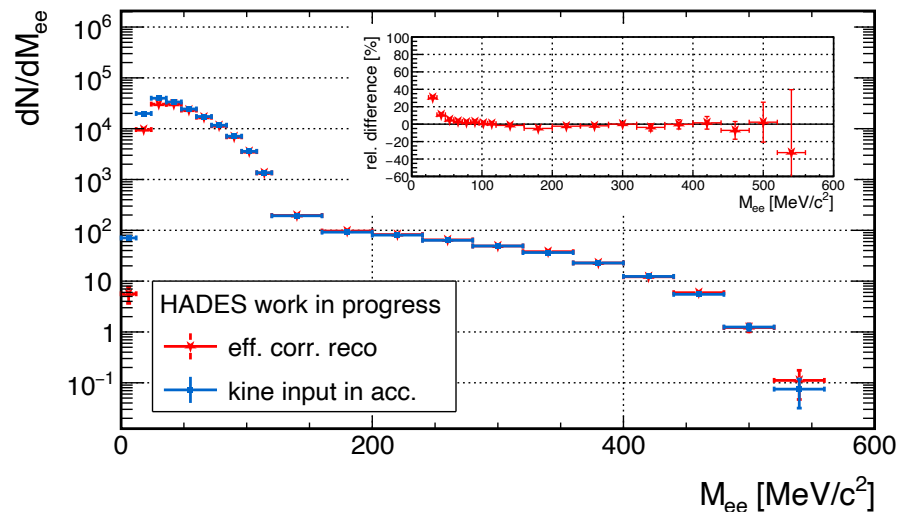
# Updates in PID

- Fits have been reperformed
- No major changes in cut values
- Simulations haven't changed (for leptons at least)



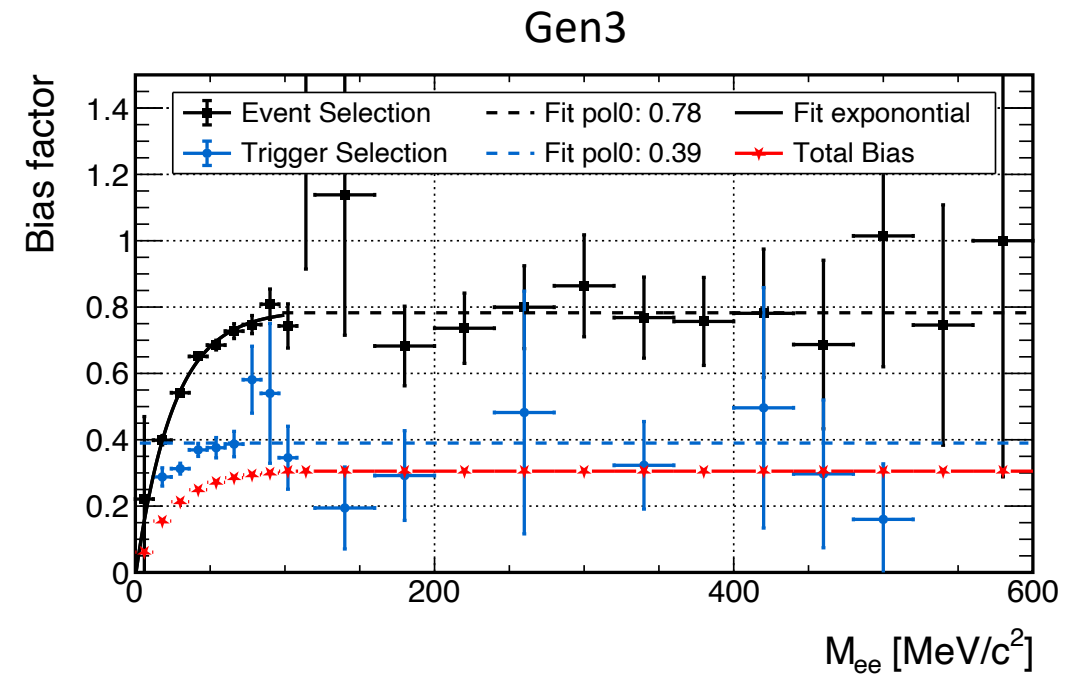
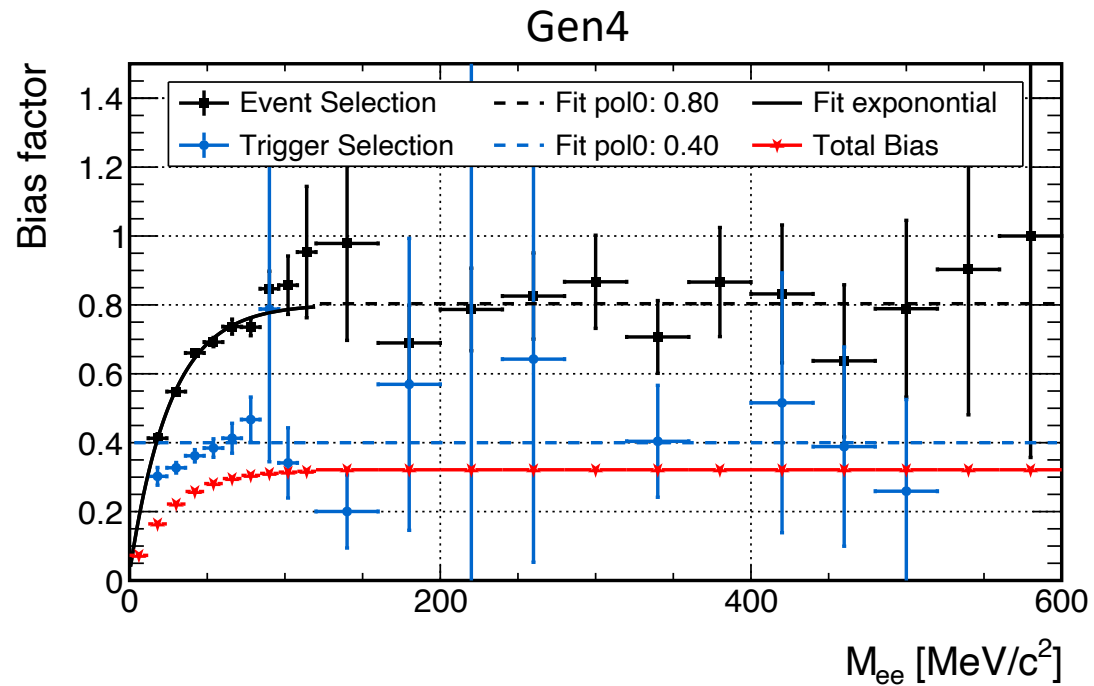
# Updates in corrections

- Single electron correction matrices unchanged compared to Gen3
- Pair correction factor closer to 1 for higher invariant masses



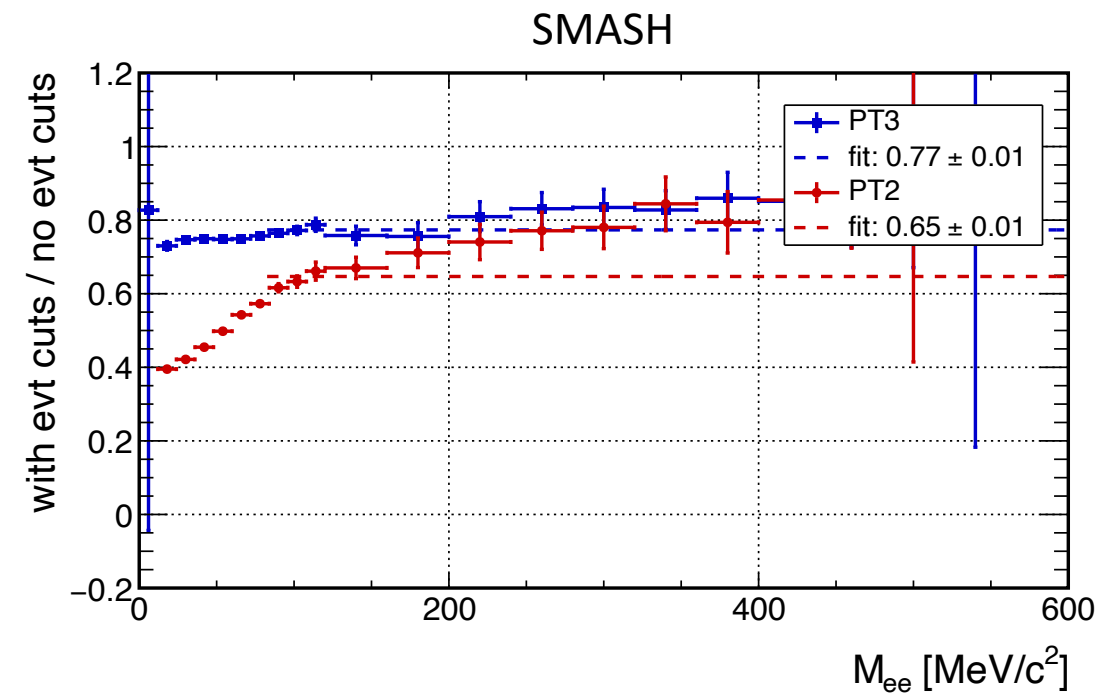
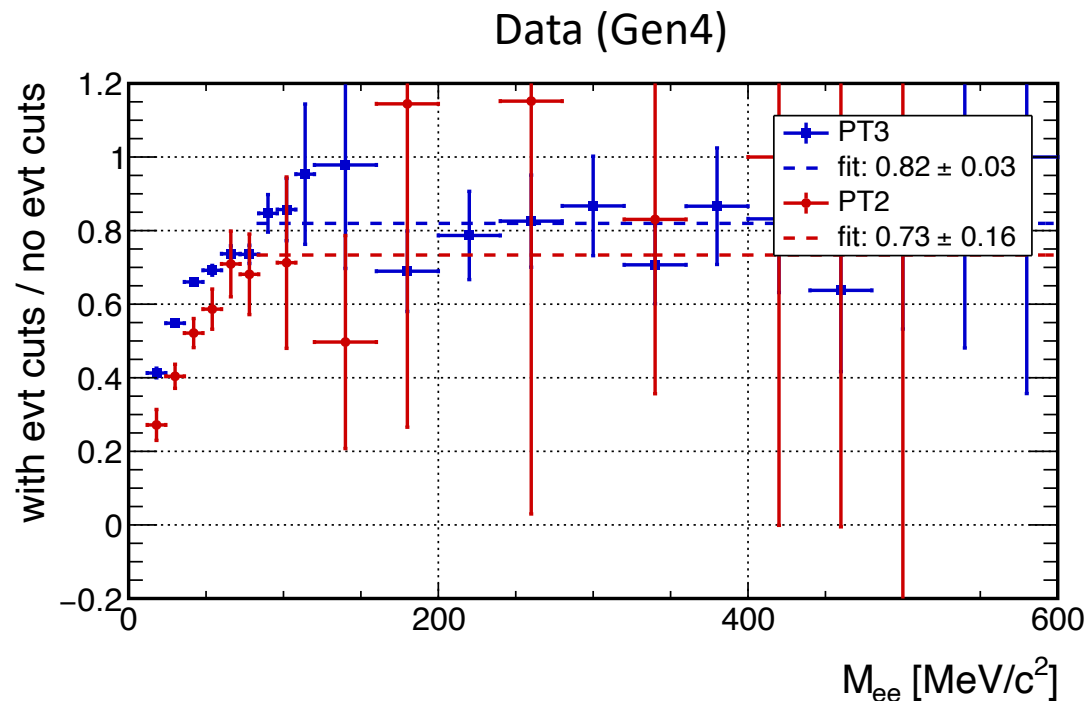
# Updates in trigger & event bias

No significant changes in bias for trigger and event vertex selection.

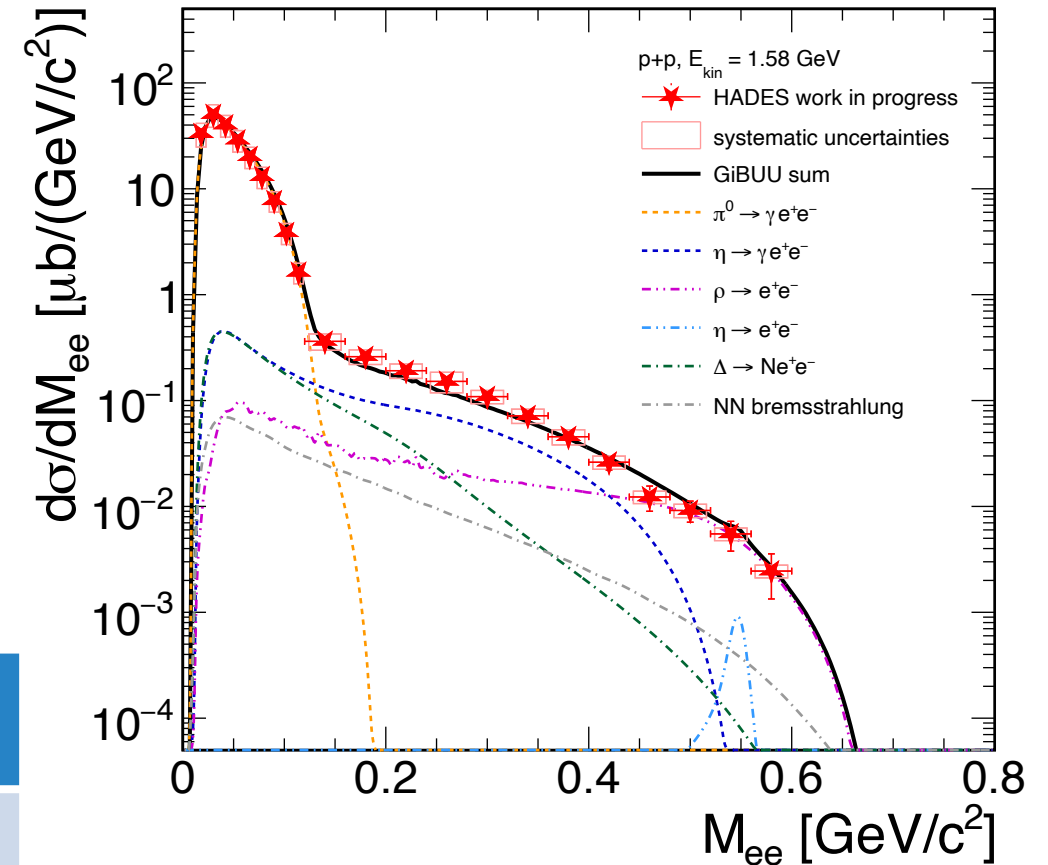
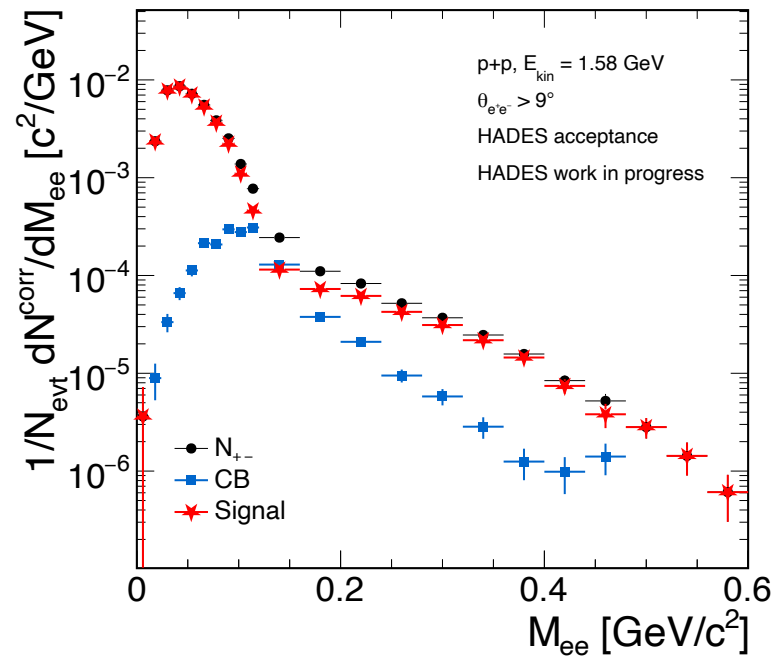


# Updates in event bias

Comparison to SMASH simulation started: Values comparable for PT3 case, shape comparable for PT2 case. Still under investigation.



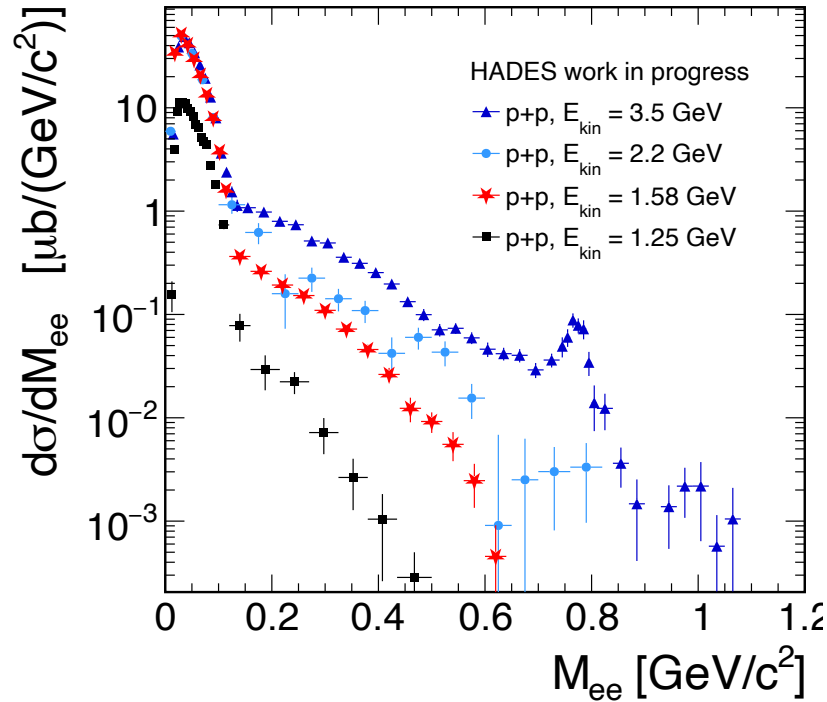
# Updates in full target results



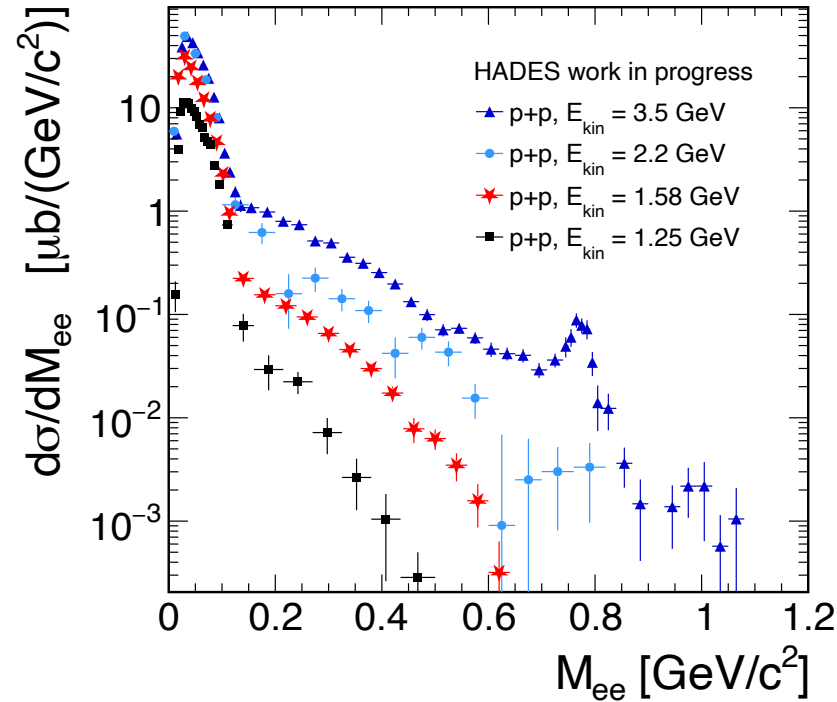
$M_{ee}$	$\leq 120 \text{ MeV}/c^2$	$> 120 \text{ MeV}/c^2$ $\leq 550 \text{ MeV}/c^2$	$> 550 \text{ MeV}/c^2$
$N_{pairs, raw}$	56 434	2 171	8
$N_{pairs, ax\epsilon corr}$	215 127	6 283	20

# Updates in full target results

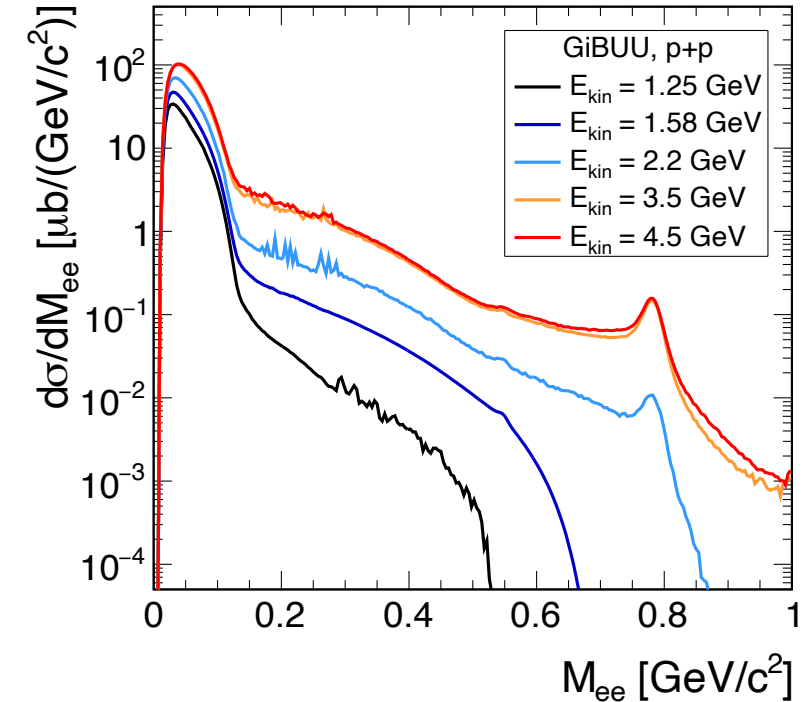
Acc & Eff Corr



Eff Corr



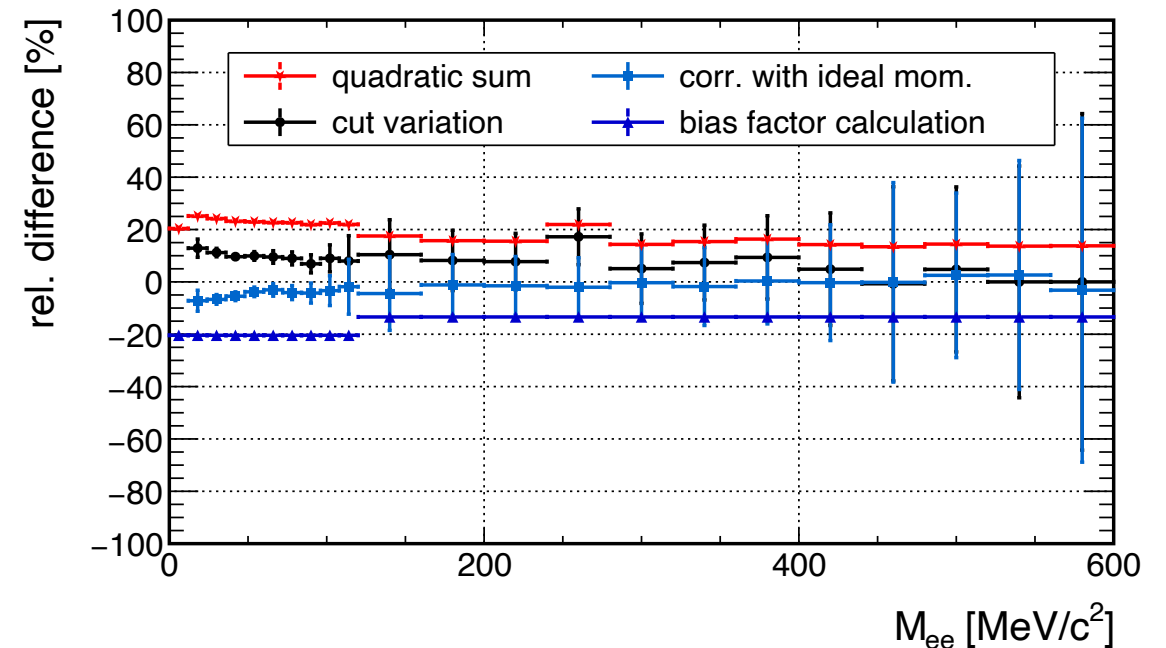
GiBUU



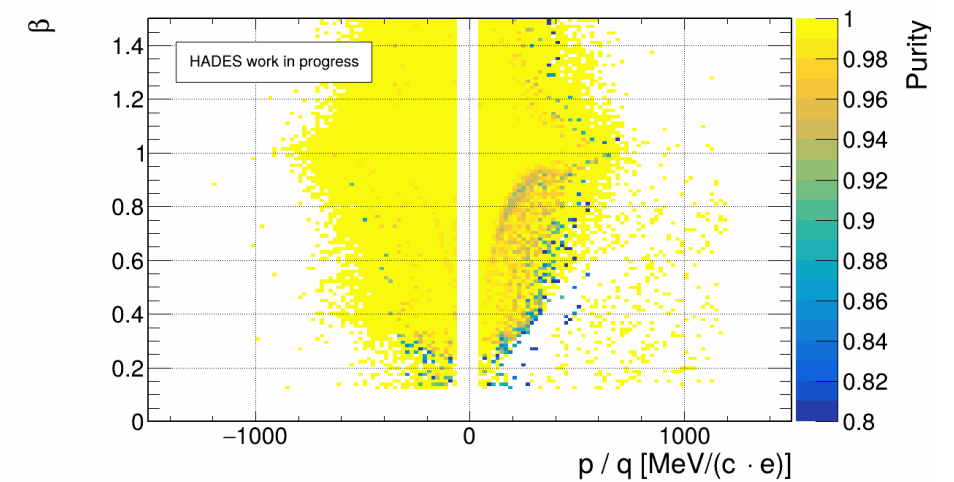
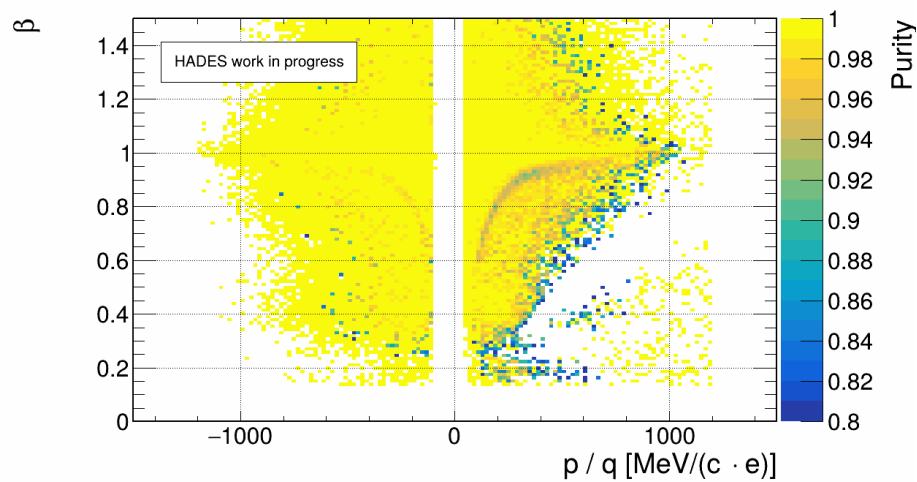
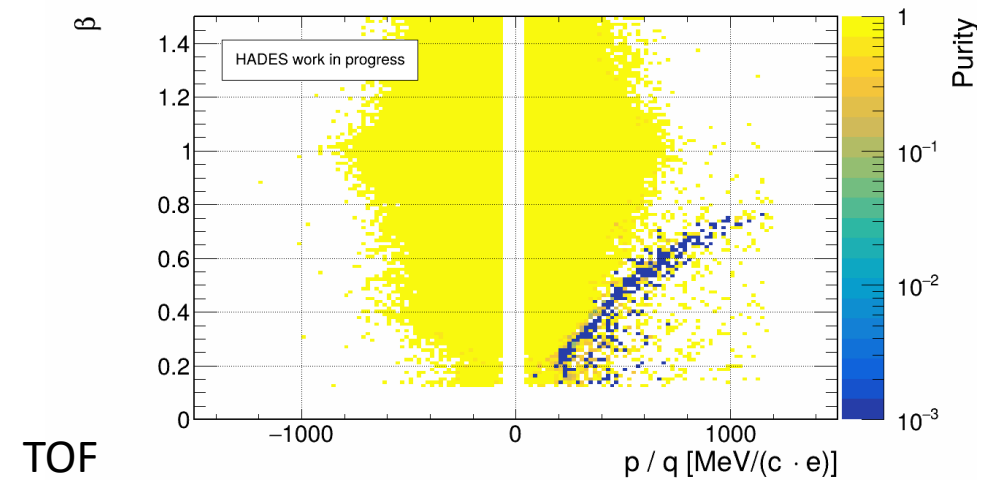
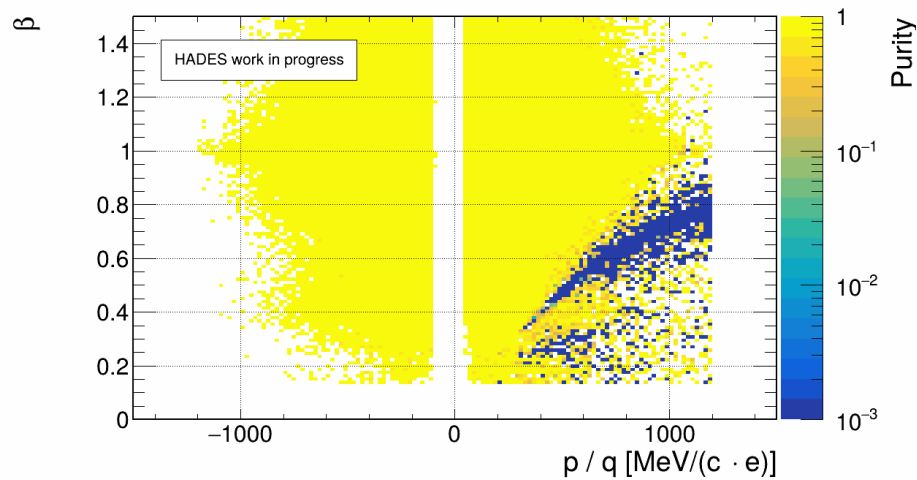
Comparison to older HADES p+p measurements need to be done with efficiency correction only. Under investigation: Can old data be corrected for acceptance?

# Updates in systematic uncertainties

- Bug fixed in calculation of “corr. with ideal mom.” which only effected the sys. uncertainty calculation
- New uncertainties are smaller: 20 % (Gen4) in  $\pi^0$  region 30 % (Gen3) in  $\pi^0$  region
- RICH rotation results without any changes (next slide)

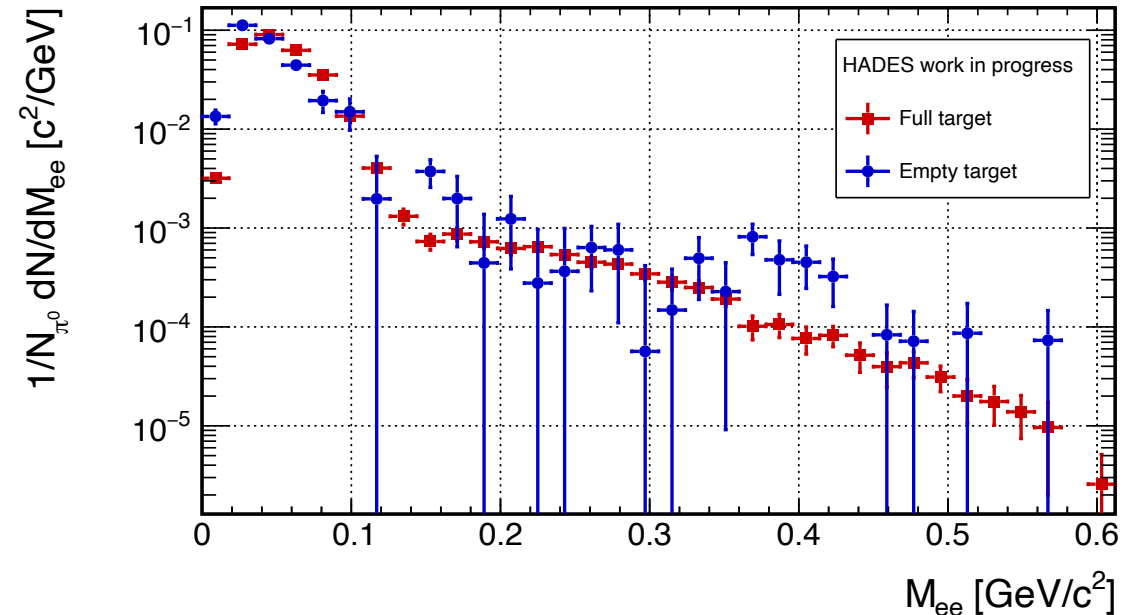
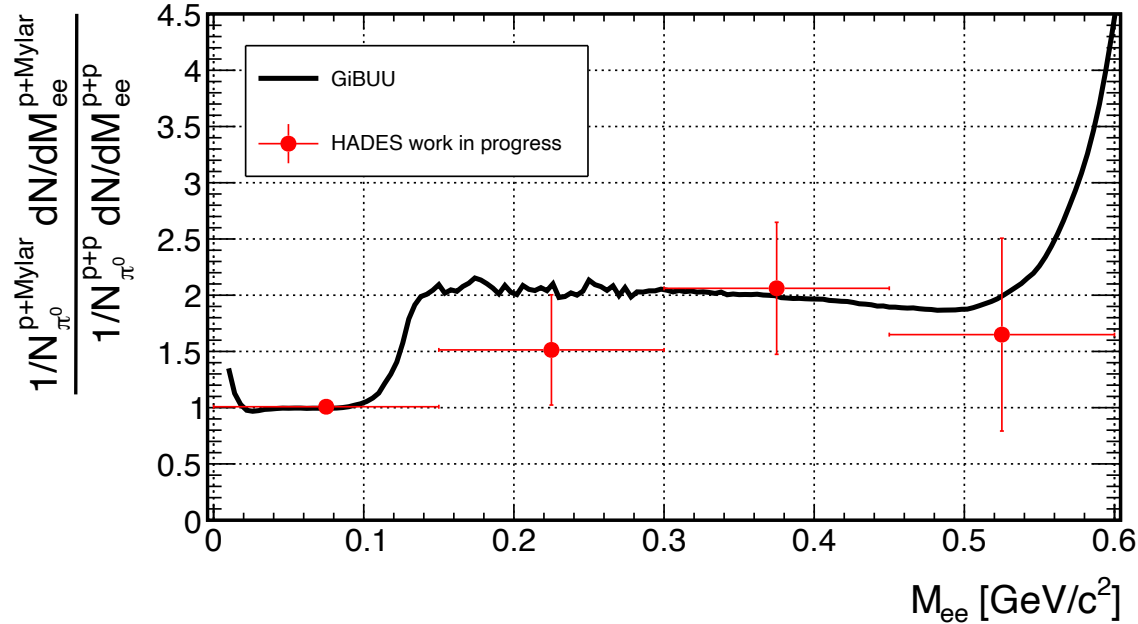


# Updates in systematic uncertainties



# Updates in empty target results

p+Mylar / p+p moved to lower values. However, within errors still in agreement.



# Preparation of Paper and Analysis Note

- Full rerun of the analysis with Gen4 data completed
  - New Run of GiBUU reference (version 2025) completed
  - Finalization of systematic uncertainty calculation
  - Clean-up of the directory/code has been performed
  - Paper proposal close to final
  - Analysis note close to final
- Looking forward to meet the paper writing committee and present the full analysis in a PWG Dilepton meeting

Analysis Note  
Dilepton Reconstruction in p+p at 1.58 GeV beam kinetic energy

Karina Scharmann  
contact: karina.scharmann@physik.uni-giessen.de

June 19, 2026

**Abstract**

The analysis note outlines the steps of the dilepton reconstruction analysis in p+p collisions from 2022, measured at  $E_{\text{lab}} = 1.58$  GeV. The first part of the note focuses on key analysis decisions and plots to help determine the validity of the analysis. The full code to reproduce each plot, along with the relevant root files, will be available at: /u/kscharm/hades/master. The second part of the note will help you rerun the analysis in case a new generation of DSTs emerges.

**General Information**

This analysis has been performed with the following software versions:

- Cluster version: Virgo 4, Debian 12 (vae25)
- ROOT version: 6.36.02
- HYDRA version: Hydra2-7.4

The following DST files of February 2022 have been used:

- *SMASH* : /lustre/hades/datsim/feb22/p1580p/gen4/smash/smash\_lepton/
- *WHITE* : /lustre/hades/datsim/feb22/p4500p/gen4/white/e- and /lustre/hades/datsim/feb22/p4500p/gen4/white/e+
- *FULL TARGET* : /lustre/hades/dst/feb22/gen4/filelists/1580MeV/target
- *EMPTY TARGET* : /lustre/hades/dst/feb22/gen4/filelists/1580MeV/emptytarget

The short forms will be used in the following note to refer to the input/file list paths shown.

1