

Neutral meson production on ALICE

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28/September/2018



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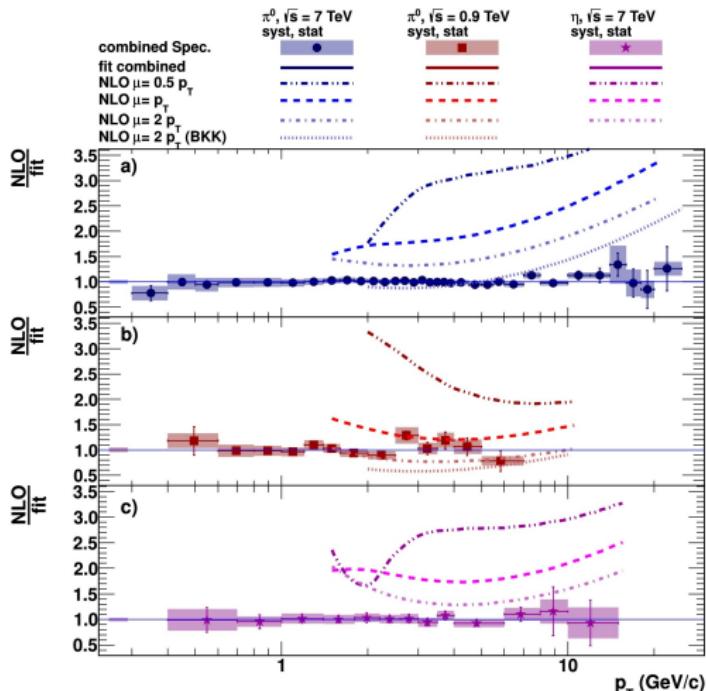


Outline

- Physics motivation
- Introduction on the analysis
- Results of neutral meson on $\sqrt{s} = 5 \text{ TeV}$
- Summary

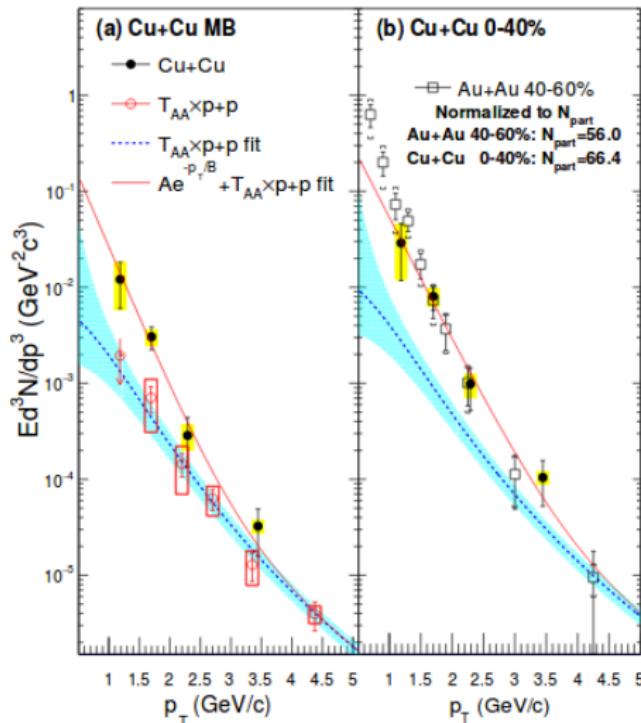
Physics Motivation: Contribution to $pQCD$

- The study of hadron production can provide constraints for the parton fragmentation and distribution functions (PDF).



- At high p_T , π^0 and η provide tools to test $pQCD$ with pp collisions. At low p_T region, neutral mesons can give insight about collective effects via modification of the p_T spectra.

Physics Motivation: Direct photons

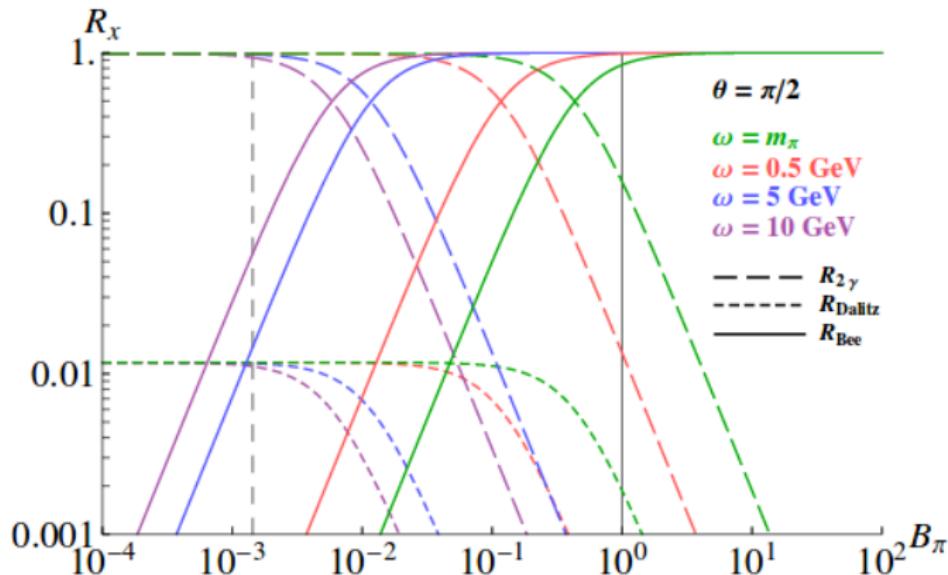


- Direct photons at low and intermediate p_T is good signal of QGP , but we need to clean the signal from all background, that means remove all the photons that we know.

(PRL106,242301(2011)).

Physics Motivation: Branching ratio with Magnetic Field

- π^0 exhibit interesting phenomena in strong magnetic field (\mathbf{B}): In external \mathbf{B} the π^0 has only one diagram, the decay mode of π^0 into two photons can not persist in the dominant mode:
 $\text{arXiv:1305.7224[hep-ph]}$.



Data Set Info

The info for the data set are, LHC17pq and LHC15n, for the first one we are using the reconstruction FAST:

- *LHC15n_5TeV_pass3*
 - run 2, pass 3, Child 1, Runlist 1
 - Around 4.4e07 events \approx 6.6% of all statistics.
- *LHC16k5b_PYT6_5TeV_ancLHC15n_p3*
- *LHC17_5TeV_pass1_FASTandWOSDD*
 - run 2, pass 1, pq sets, child 1 and 3, Runlist 1.
 - **FAST** around 93%
- *LHC17I_PYT8_5TeV_ancLHC17pq_p1_cent*

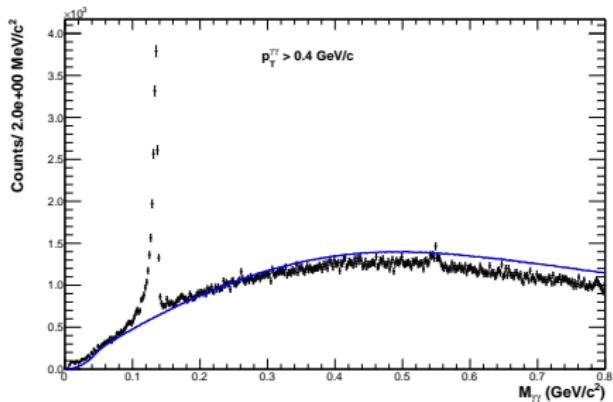
To analyse 5TeV we need more MC data for the analysis

Introduction: Reconstruction technique to neutral meson

In this analysis, the π^0 and η meson are reconstructed via the detection of their Dalitz decay products ($e^+e^-\gamma$).

- The positron and the electron are detected using the *TPC* and *ITS*.
- The gamma is detected using the Photon Conversion Method (*PCM*).
- The combinatorial background is estimated using the mixed event technique.
- The π^0 peak is fitted with a convoluted function (gaussian + exponential + linear function).

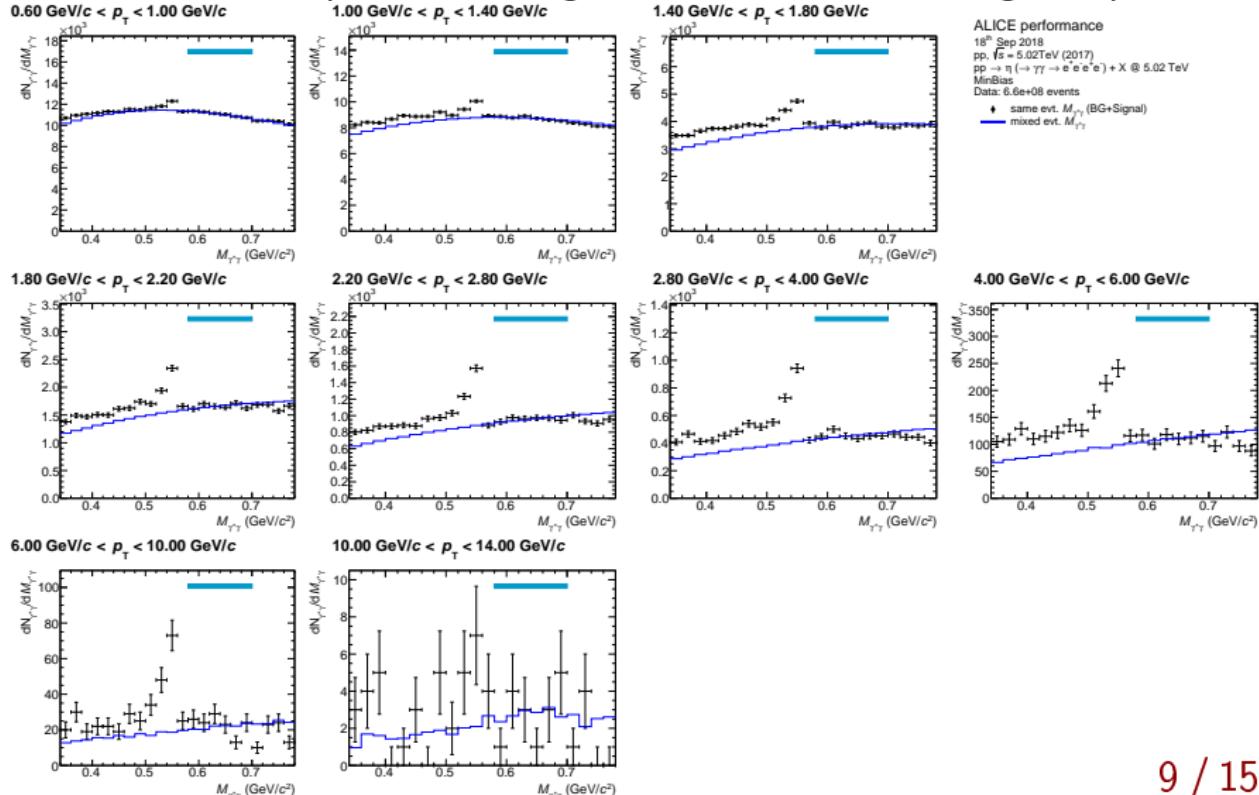
Invariant mass from experimental data



- Background of events mixed is scaled by the integration of the invariant mass for both neutral meson.
- Working on different ranges of p_T we can reconstruct Dalitz on a very solid range of transverse momentum for π^0 and η .
- The binning is the same as the other 5 TeV analysis in preparation, with the idea to make the possible combination.

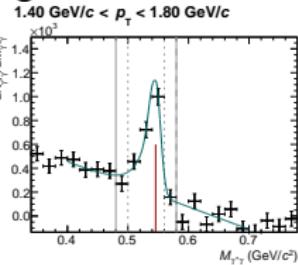
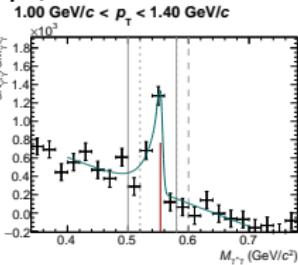
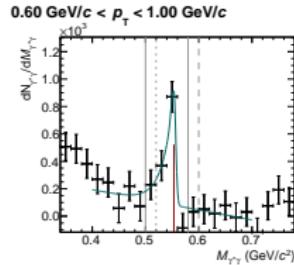
η experimental data results

η invariant mass on p_T bins, background normalized on ranges of p_T .



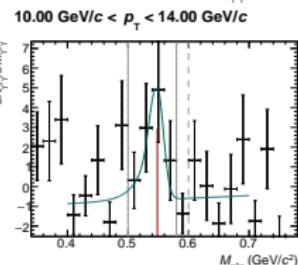
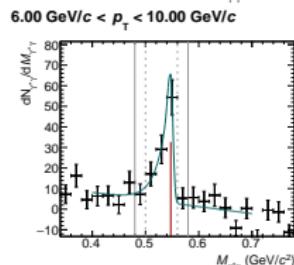
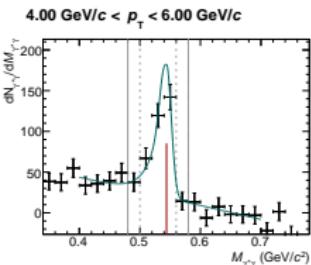
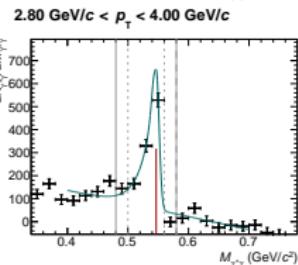
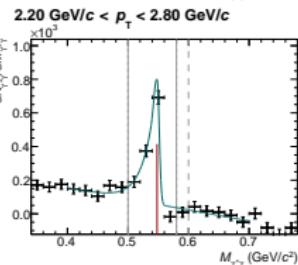
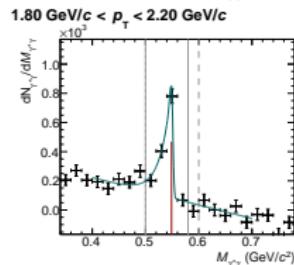
η experimental data results

η invariant mass on p_T bins, after background subtraction.

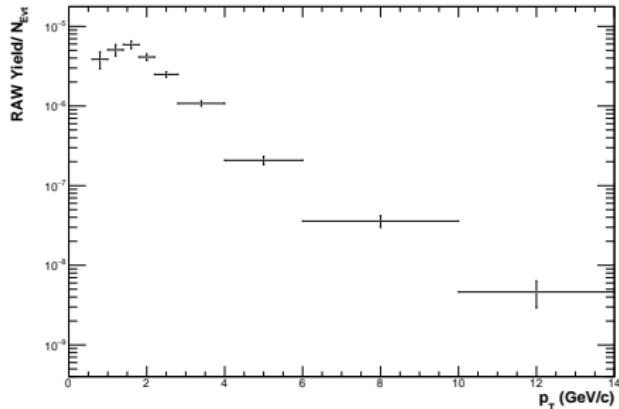


ALICE performance
18th Sep 2018
 $\text{pp}, \sqrt{s} = 5.02 \text{TeV}$ (2017)
 $\text{pp} \rightarrow \eta \rightarrow \gamma\gamma \rightarrow e^+e^-e^+e^- + X @ 5.02 \text{TeV}$
 $\gamma\gamma$ rec. with PCM, Dalitz
Data: 6.6e+08 events

- ♦ mixed evt. substr. $M_{\eta\eta}$
- Fit



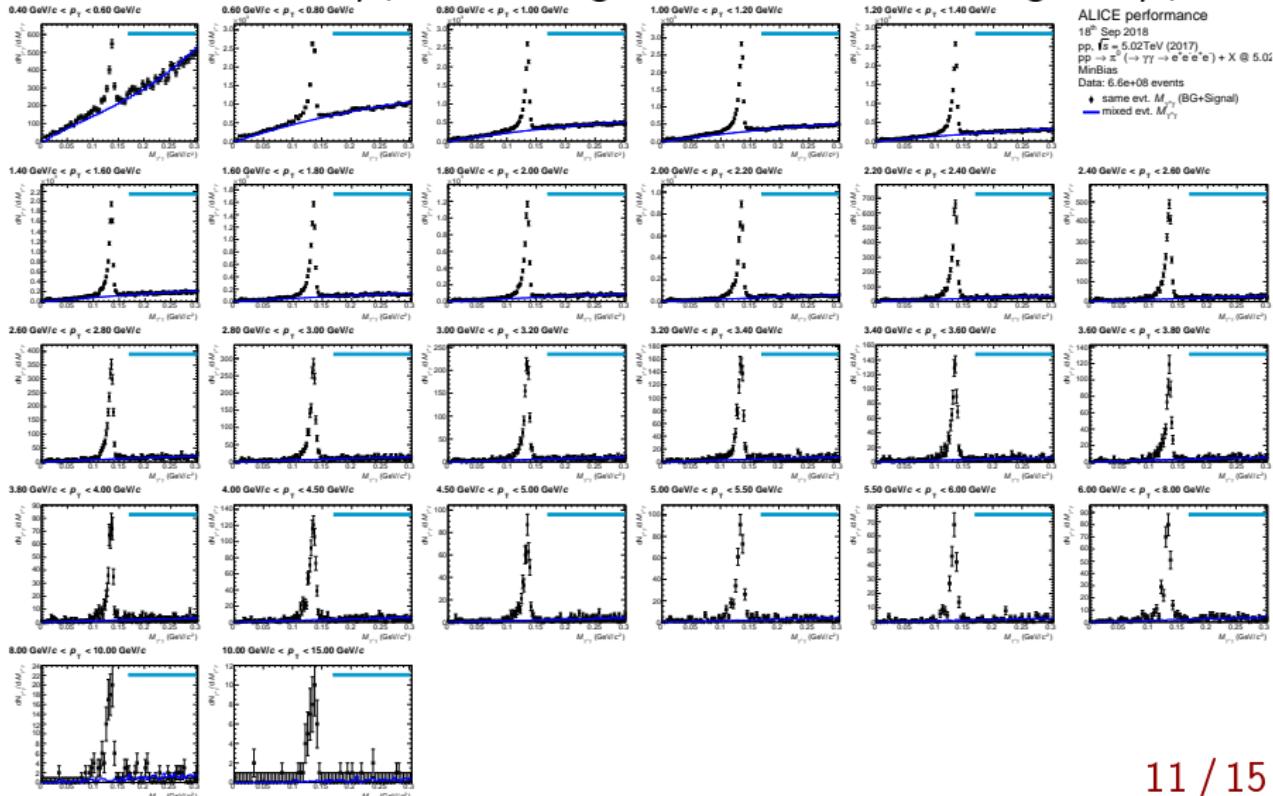
Raw Yield for η



For the case of meson η we have issues with the fitting range of the peak of the mass calculating the efficiencies and the systematic error.

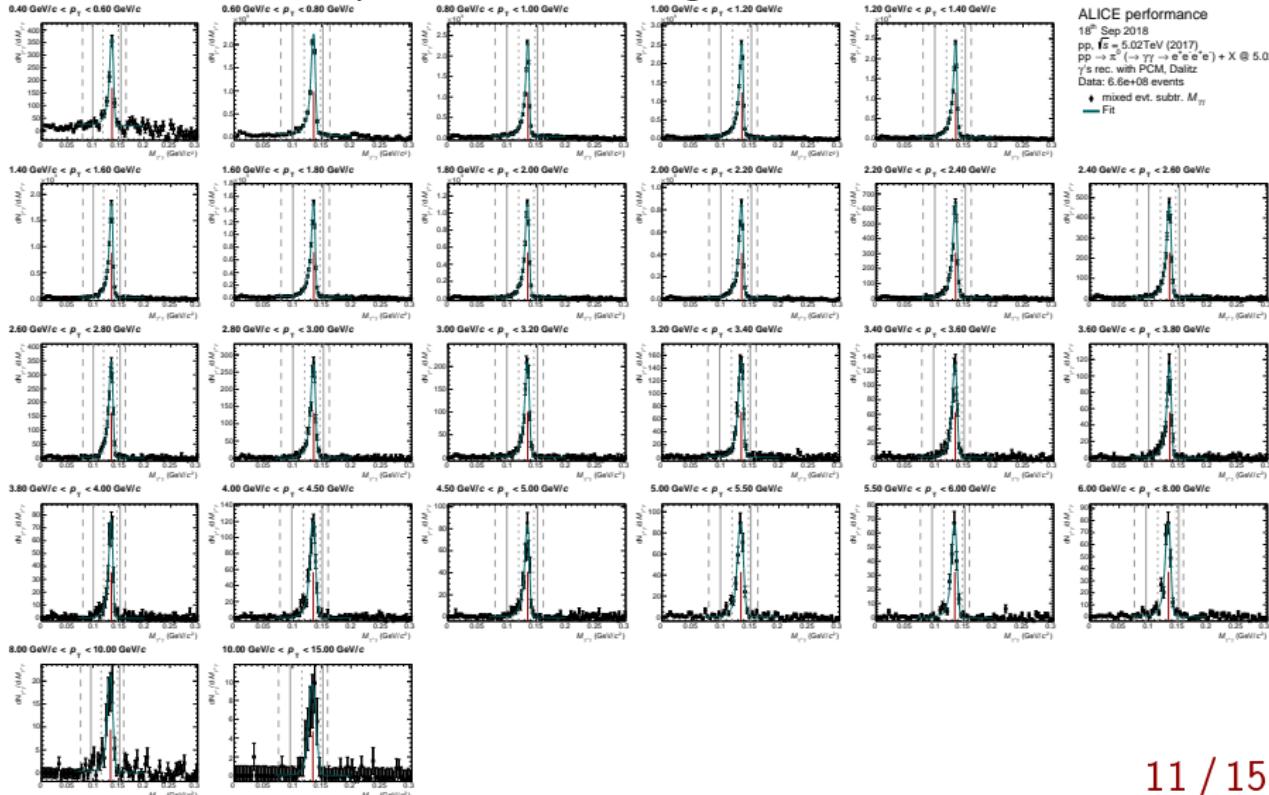
π^0 experimental data results

π^0 invariant mass on p_T bins, background normalized on ranges of p_T .

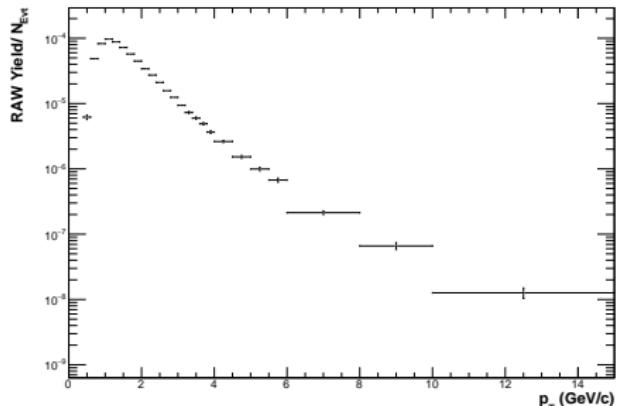


π^0 experimental data results

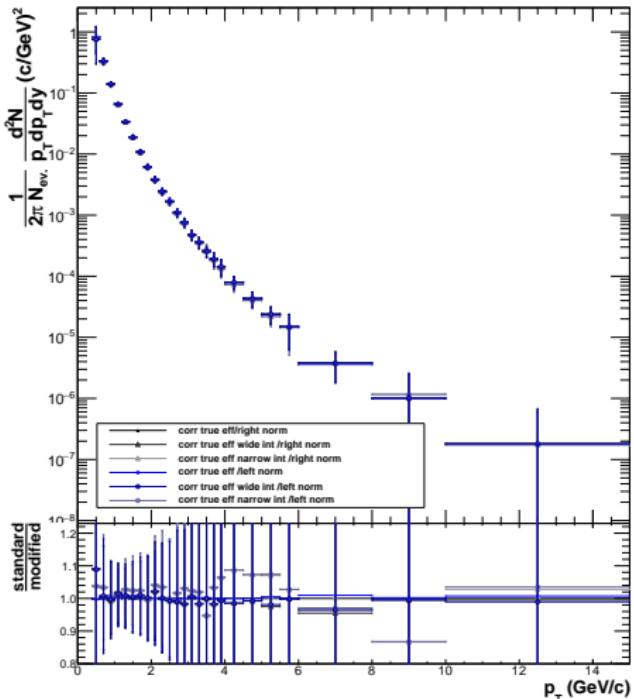
π^0 invariant mass on p_T bins, after background subtraction.



Raw and Corrected Yield for π^0



The yield is corrected by acceptance, efficiency and Dalitz branching ratio. The contamination fraction from the $\gamma\gamma$ channel is subtracted from the corrected yield.



Summary

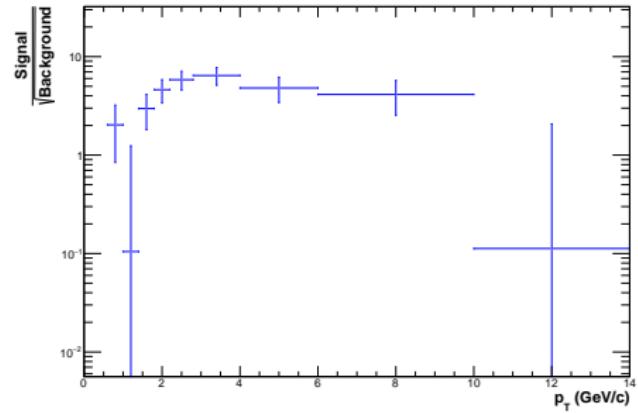
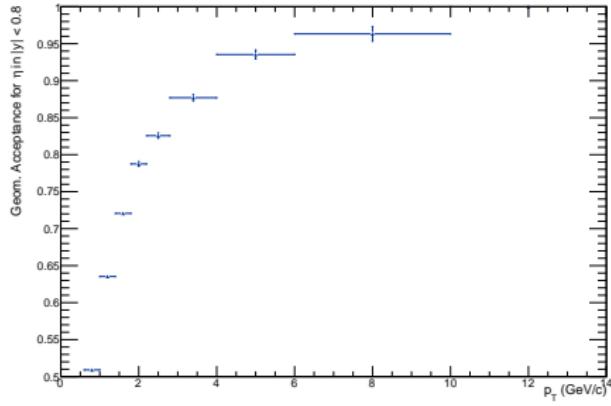
Highlights

- We measured the η and π^0 mesons with Dalitz method on p_T bins from 0.6 to 10 GeV/c for the first and from 0.4 to 15.0 GeV/c to the second one.
- The cut we are using show better result for η in the first bin, but we lost efficiency for the π^0 , we keep working on improving or cut.

Outlook

- Improve the η signal with the electron cut.
- Deliver Dalitz measurement (η and π^0) for the combination to other measurements.
- Working on the 13 TeV data set.

Acceptance and Significance for η



Acceptance and Significance for π

