

***Preparation for QM2019: Status of the Hyperon Flow Analysis***

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Issue on nc-cluster and library compilation:

e.g.

```
make[2]: Warning: File `/nica/mpd4/geraks/mpdroot-050919/flow/utility.h' has  
modification time 203 s in the future
```

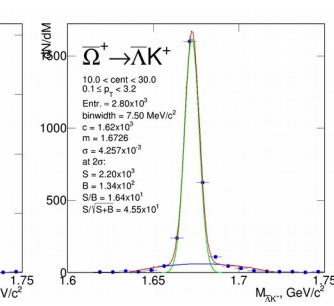
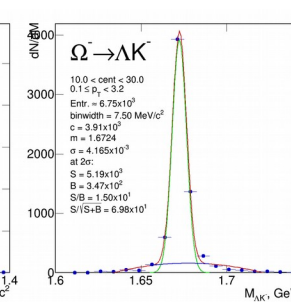
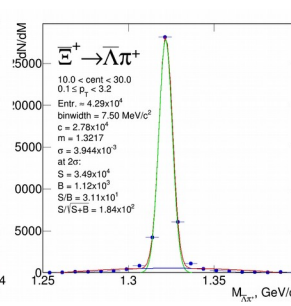
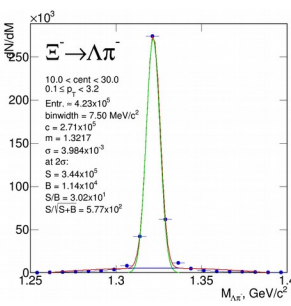
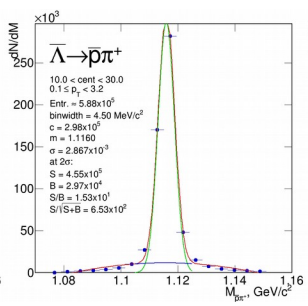
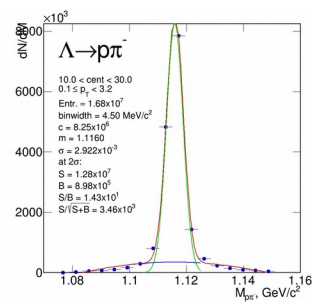
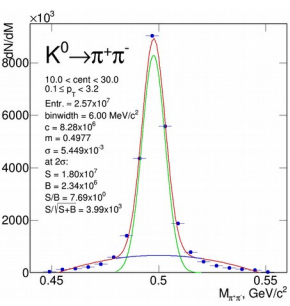
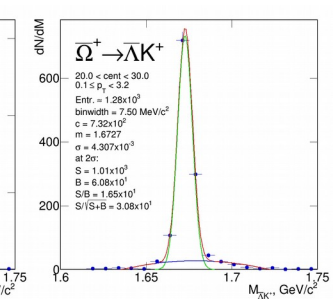
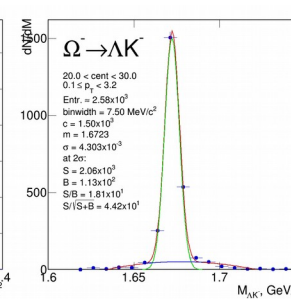
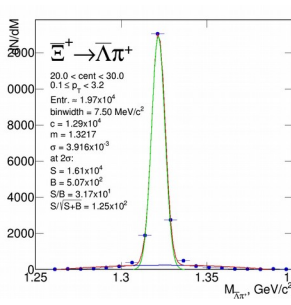
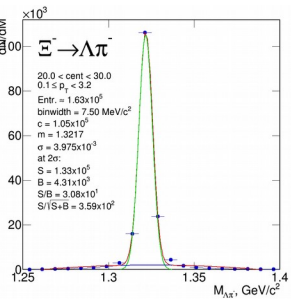
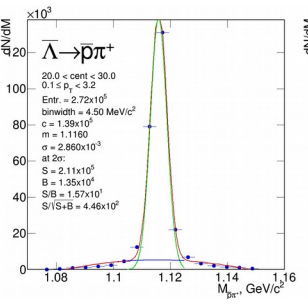
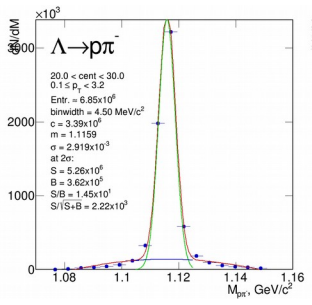
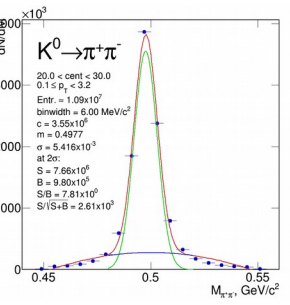
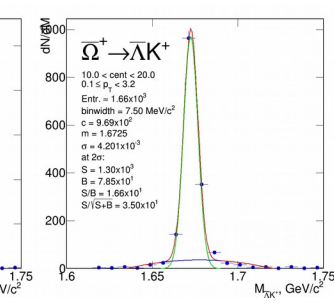
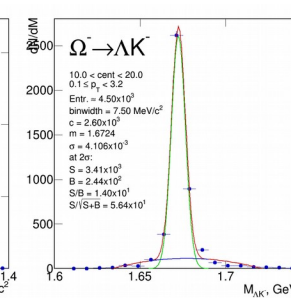
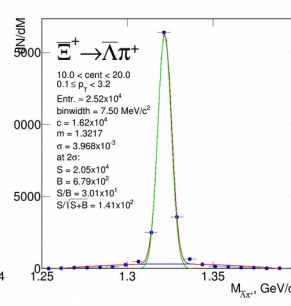
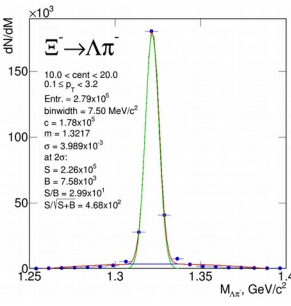
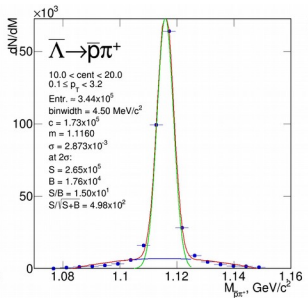
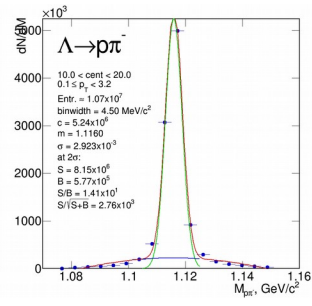
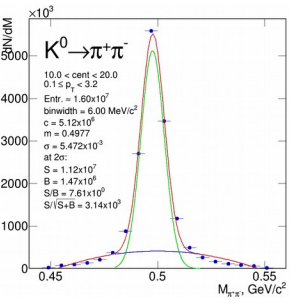
```
make[2]: warning: Clock skew detected. Your build may be incomplete.  
This sometime causes problems, sometimes – not.
```

25 million events, UrQMD 3.4, 11 GeV, 0-16 fm,  
RECO: TPC ClusterMLEM, TOF, FHCaI

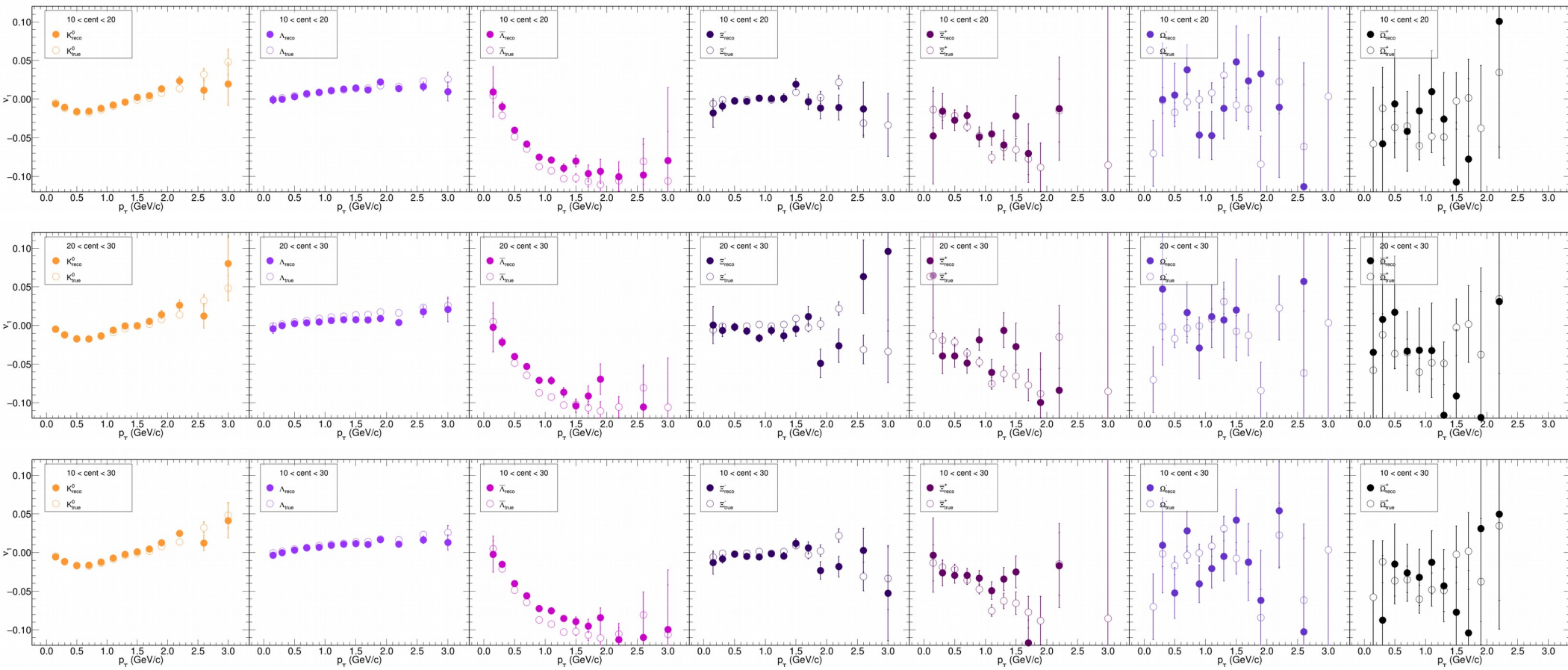
ParticleTrue + RECO → Flow Reduced Files → Flow Analysis  
Results presented here.

ParticleCuts + RECO → Flow Reduced Files → Flow Analysis  
Technical issue with applying cuts is fixed. Some tests are done.

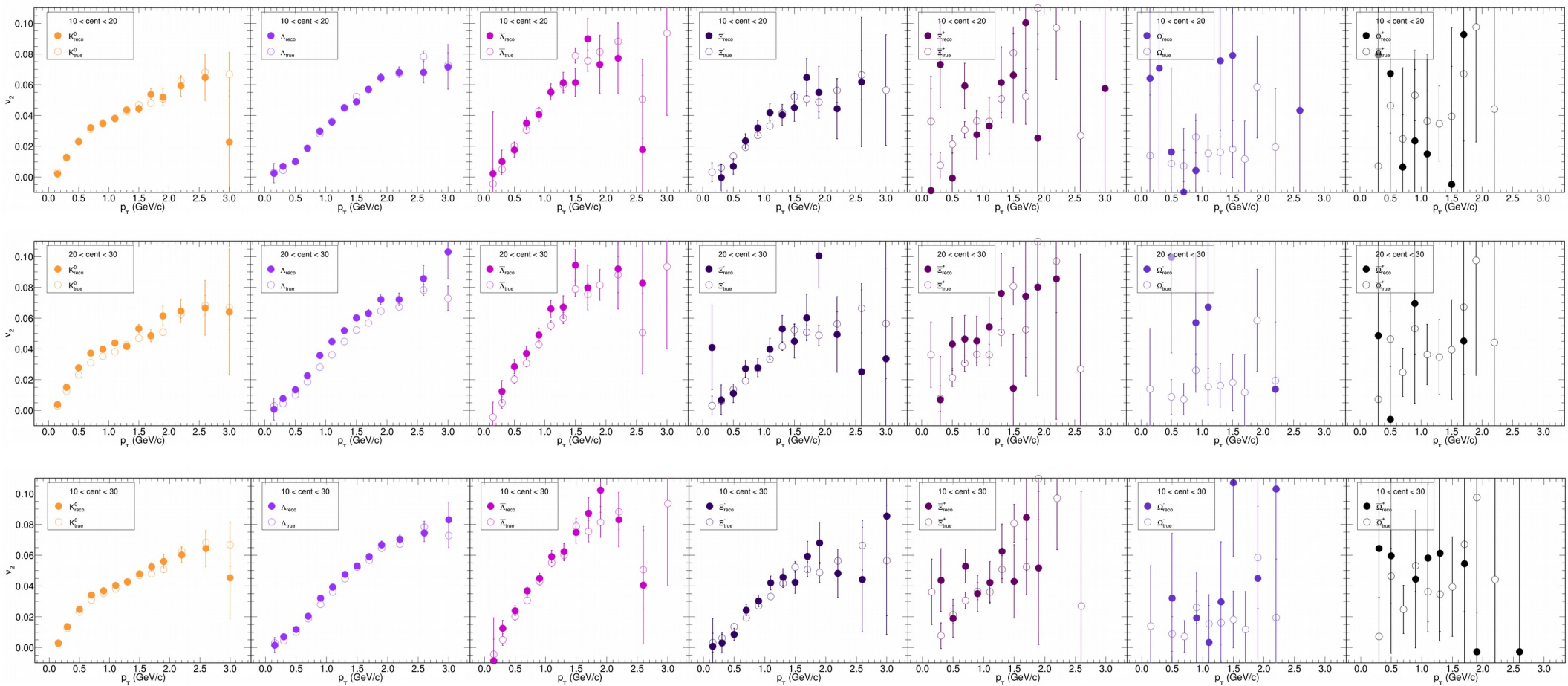
# Invariant mass



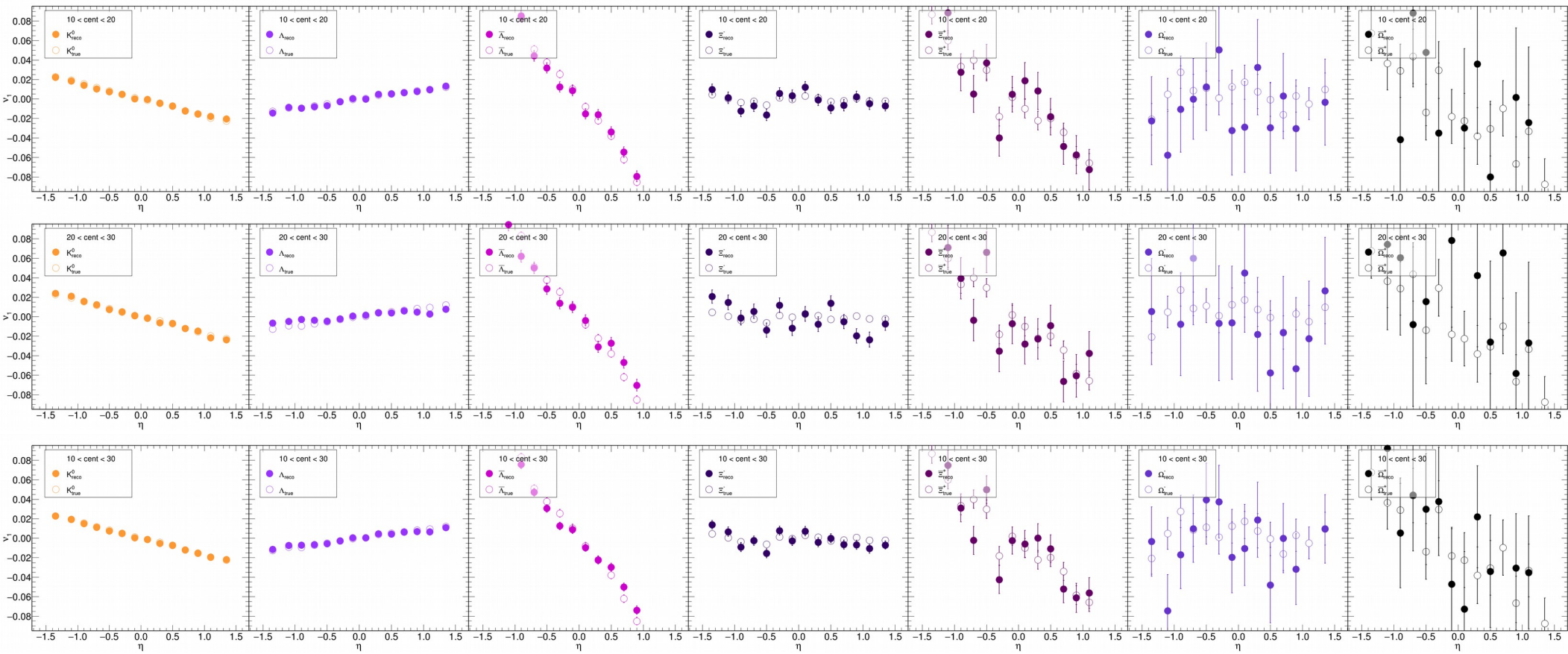
# Directed Flow vs Transverse Momentum



# Elliptic Flow vs Transverse Momentum



# Directed Flow vs Pseudo-rapidity



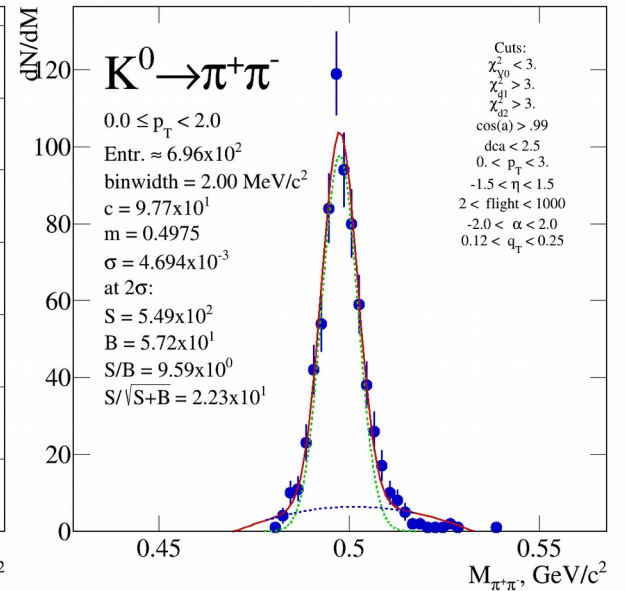
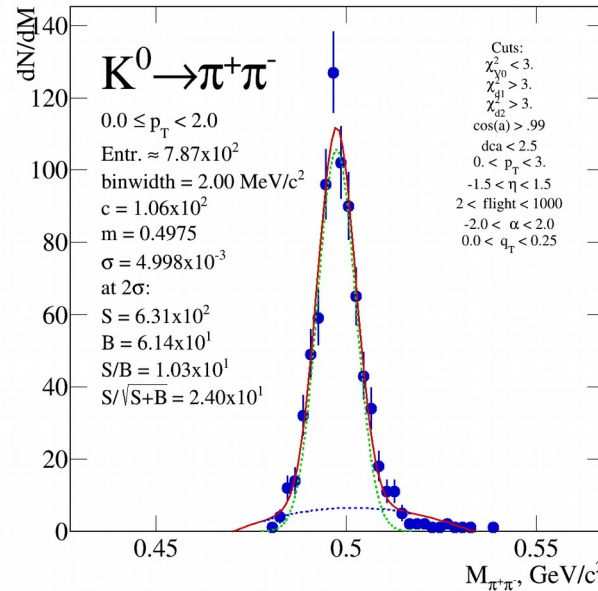
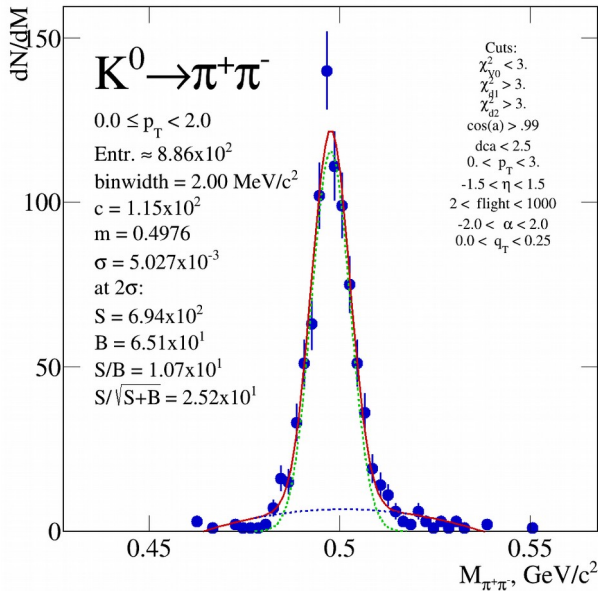
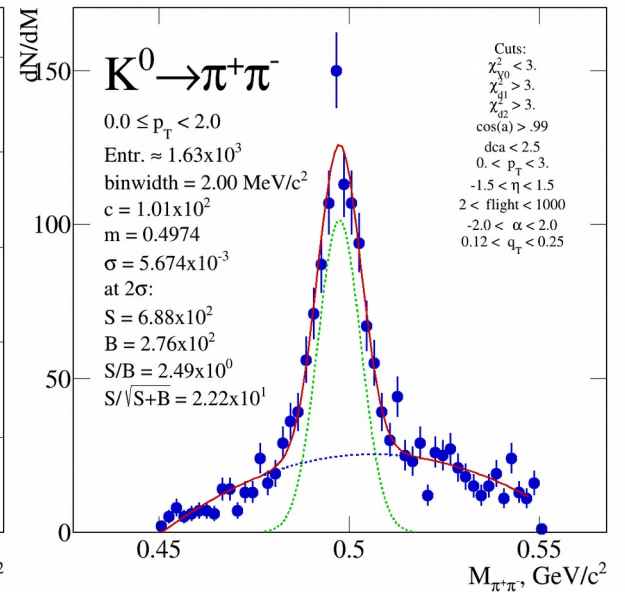
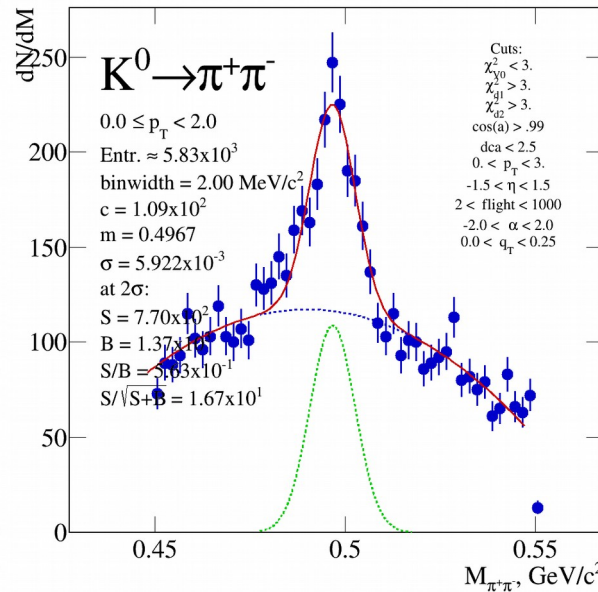
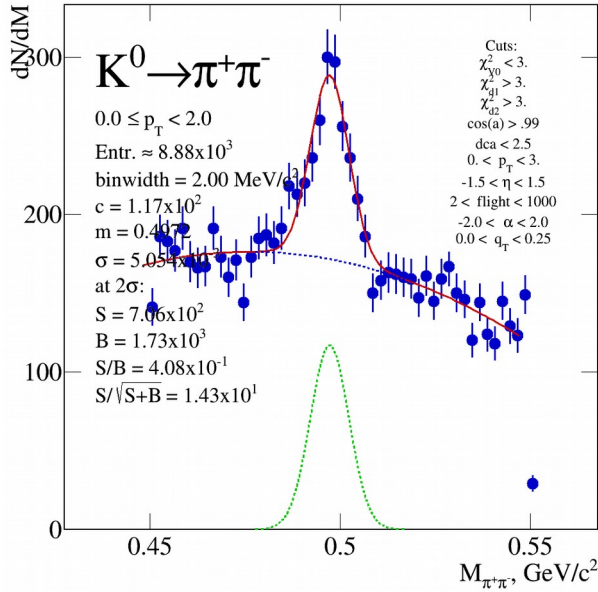
# Reconstructed Particles – Cuts(top), True(bottom)

Testing Cuts and Armentheros-Podolanski cut

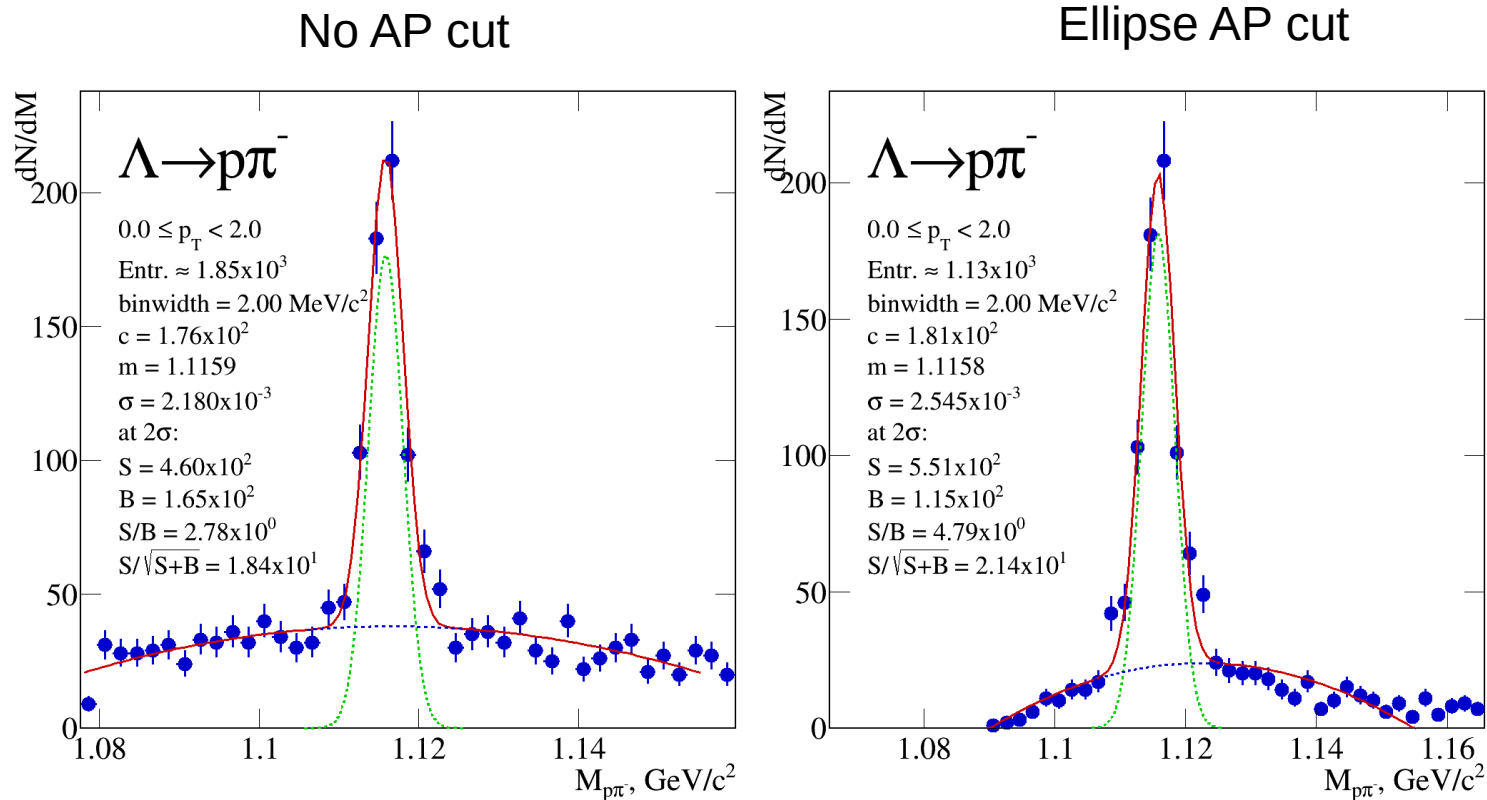
No AP cut

Ellipse  
AP cut

Ellipse+ $q_T > 0.12$   
AP cut



AP cut can be used for Lambdas, should be useful for cascades





# Proper Flow Signal Extraction

The total (s+b) flow signal can be expressed as a sum of the decay particle signal flow and background flow multiplied by the respective relative yields in  $m_{inv}$ .

The background flow contribution can be extrapolated with a linear function fitted to the sidebands

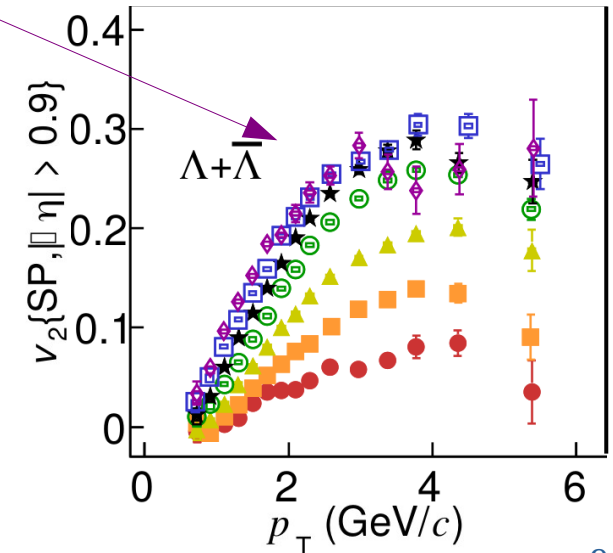
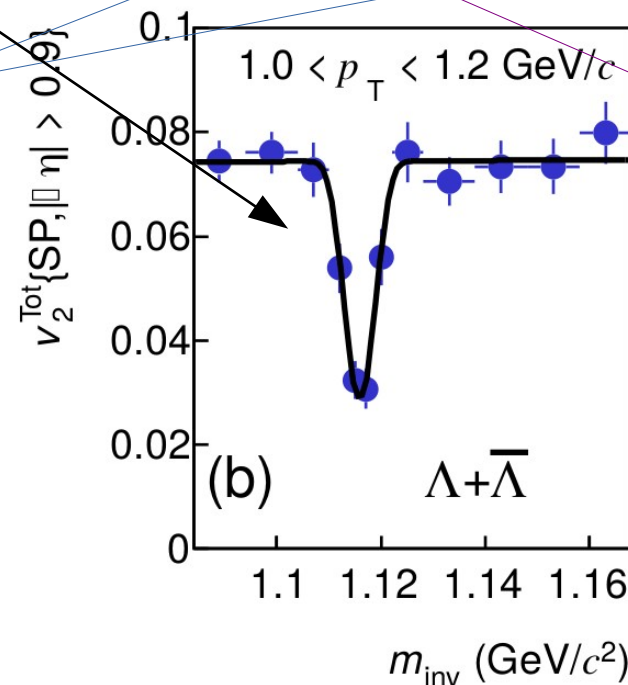
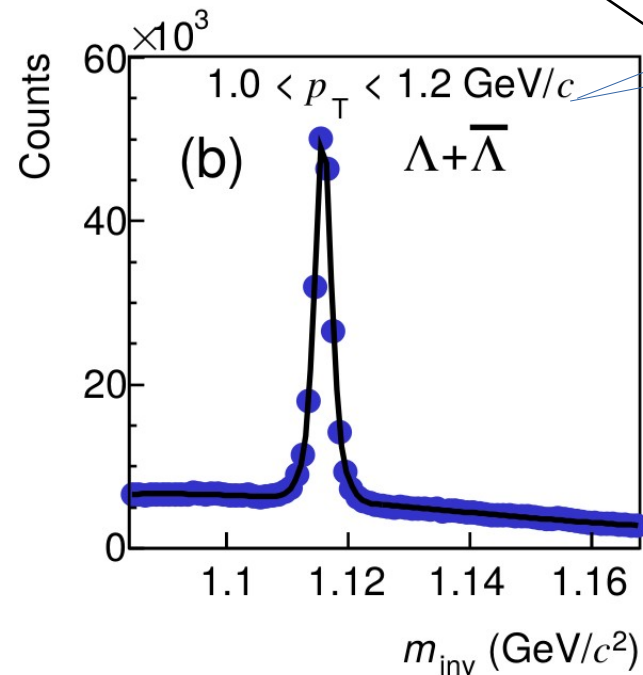
The total flow signal vs  $m_{inv}$  is fitted by the combined function and the signal contribution is extracted from the fit.

arXiv:nucl-th/0407041v2 N. Borghini, J.-Y. Ollitrault  
 arXiv:0801.3466 [nucl-ex] STAR Collaboration: B.I.Abelev  
 arXiv:1405.4632 [nucl-ex] ALICE Collaboration

$$v_2^{\text{Tot}}(m_{inv}, p_T) = v_2^{\text{Sgn}}(p_T) \frac{N^{\text{Sgn}}(m_{inv}, p_T)}{N^{\text{Tot}}(m_{inv}, p_T)} + v_2^{\text{Bg}}(m_{inv}, p_T) \frac{N^{\text{Bg}}(m_{inv}, p_T)}{N^{\text{Tot}}(m_{inv}, p_T)}$$

Extrapolate in signal region

$$v_2^{\text{Bg}}(m_{inv}, p_T) = p_0 + p_1 m_{inv}$$



# Status Proper Flow Signal Extraction

TProfile2D used – 3d object containing flow in bins of both pt and mass.

In bins of pt project TProfile flow vs mass. Fit mass

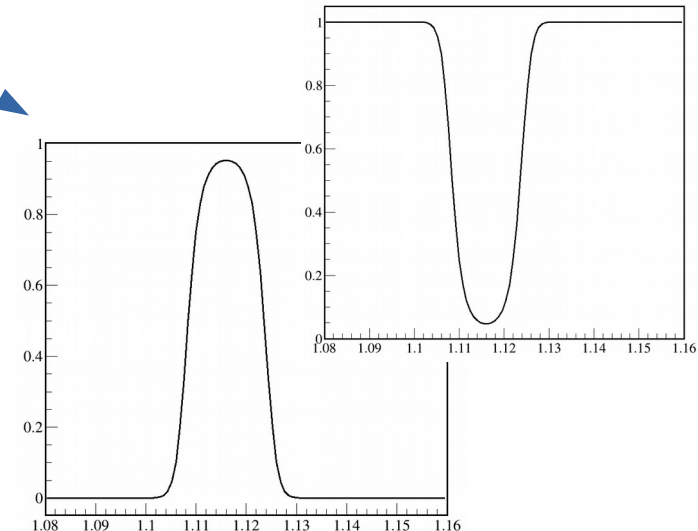
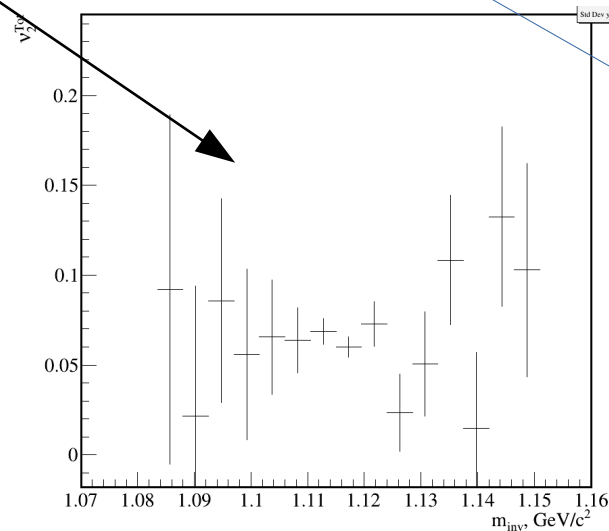
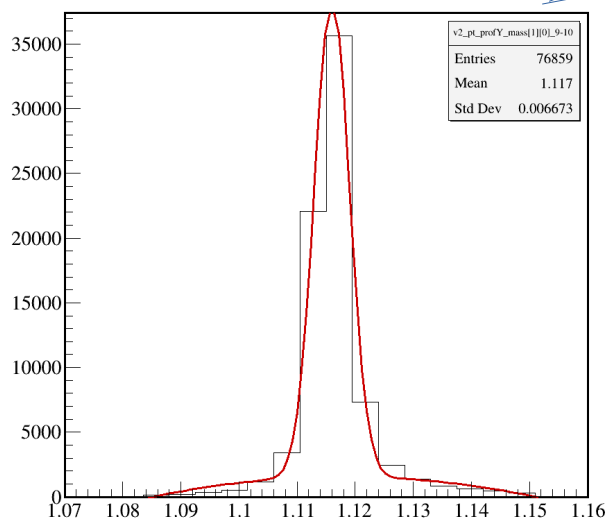
The invariant mass fit provides relative yields

TODO: Fit background flow (requires ParticleCuts file)

TODO: Fit total flow and extract signal

Extrapolate in signal region  
 $\nu_2^{Bg}(m_{inv}, p_T) = p_0 + p_1 m_{inv}$

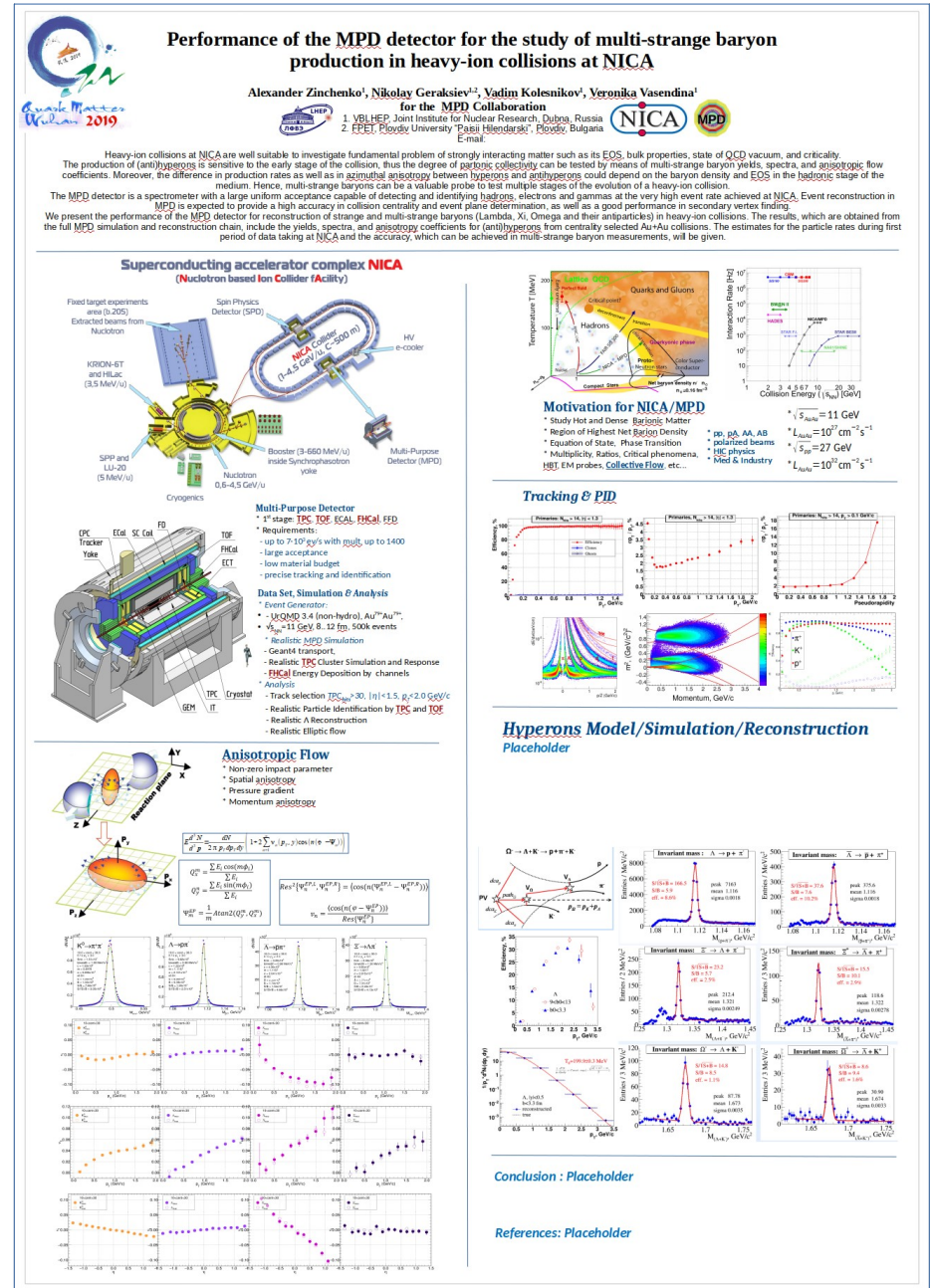
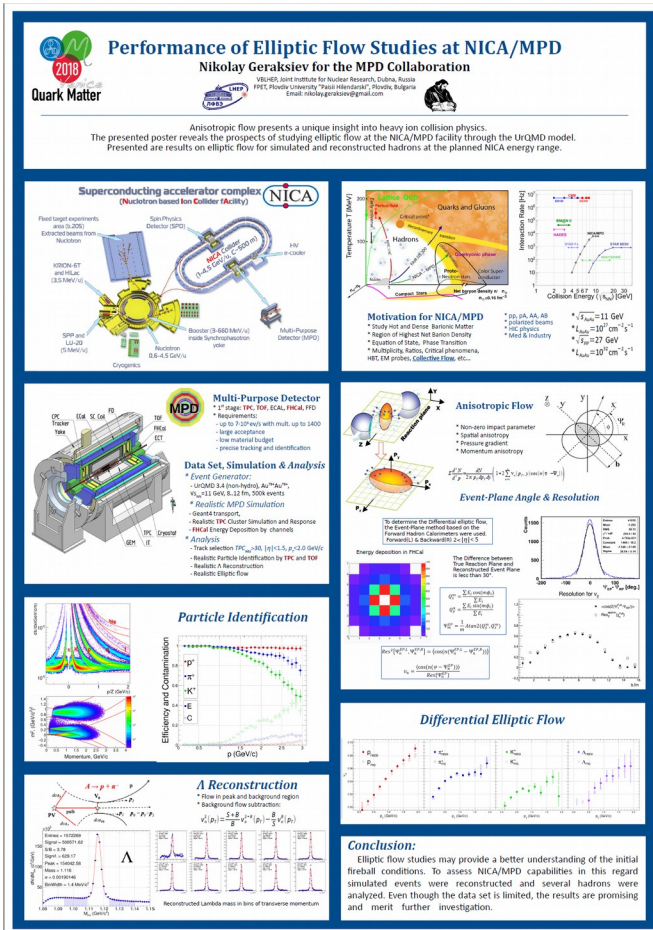
$$\nu_2^{Tot}(m_{inv}, p_T) = \nu_2^{Sgn}(p_T) \frac{N^{Sgn}(m_{inv}, p_T)}{N^{Tot}(m_{inv}, p_T)} + \nu_2^{Bg}(m_{inv}, p_T) \frac{N^{Bg}(m_{inv}, p_T)}{N^{Tot}(m_{inv}, p_T)}$$



# Some Considerations Poster QM18 → QM19

Contents in my opinion:

- \* title, abstract, conclusion ofc.
- \* accelerator facility, beam config, experiments
- \* general place in HIC physics and goals
- \* detector, mpdroot and simulation
- \* tracking, vertexing, pid
- \* reconstruction of hyperons / cuts
- \* results of analysis on hyperons
- \* flow, FHCal event-plane method, resolution
- \* results of flow analysis on hyperons



In principle analysis of 7 particle (true) is ready.  
Statistics not enough for flow studies of “true”  $\Xi^+$ ,  $\Omega^-$ ,  $\bar{\Omega}^+$ .

Depending on readiness of particle cuts and signal flow extraction procedure those can be added, as well. Probably only for  $K_s^0$ ,  $\Lambda$ ,  $\bar{\Lambda}$

***Thank you!***