



UM-BNL meeting

July 27, 2021

Saroj Pokharel, Jake Bennett



Resonant substructure in the decay:

$$\Xi_c^0 \rightarrow \Lambda^0 [p\pi^-] K^- \pi^+$$

Cut summary before analysis

- The **reconstruction** script:

Basic cuts:

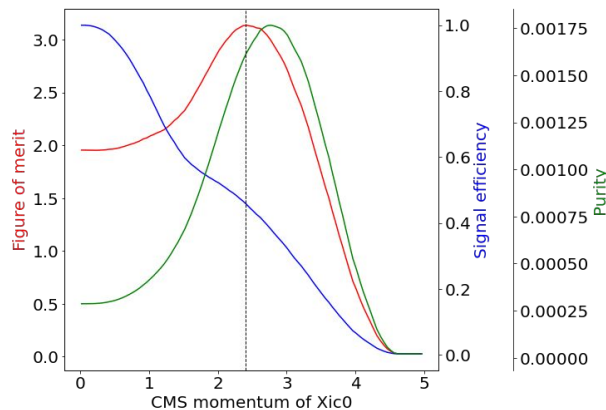
- ❑ $\text{thetaInCDCAcceptance}$
- ❑ $\text{nCDCHits} > 0$ for kaon and pions
- ❑ $\text{nCDCHits} > 10$ for protons
- ❑ $\text{dr} < 1$ cm and $\text{abs(dz)} < 4$ cm.
- ❑ $\text{protonID} > 0.2$
- ❑ Lambda0 mass constrained
- ❑ Xi_c0 mass range: $2.44 < M < 2.50$
- ❑ Lambda0 reconstructed both from V0 and $p\pi$.
- ❑ Xi_c0 vertex: ipConstrained and daughters updated and Lambda0 mass constrained.

- **Skimming** script:

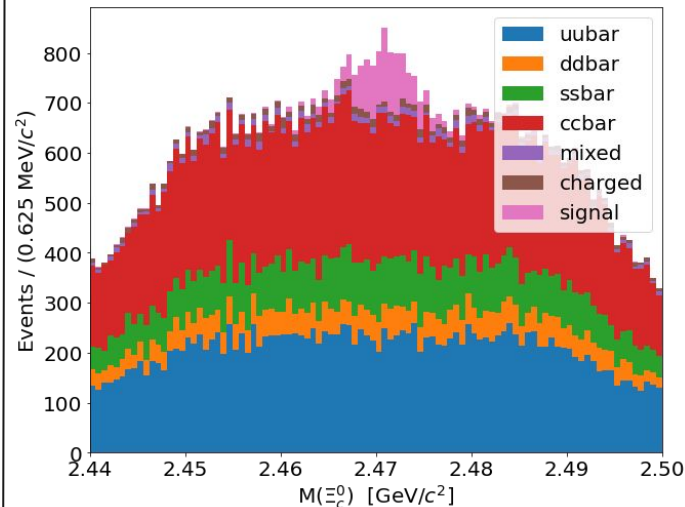
$\text{Xi_CMS_p} > 2.4$ and $\text{protonID} > 0.2$

protonID cut > 0.2 was added on skimming script to address the protons coming from V0

To get rid of those Xic0 created from bbar events (mixed and charged events) which are very low in momentum and make a huge background, we used $\text{Xi_CMS_p} > 2.4$



With $\text{Xi_chiProb} > 0.001$



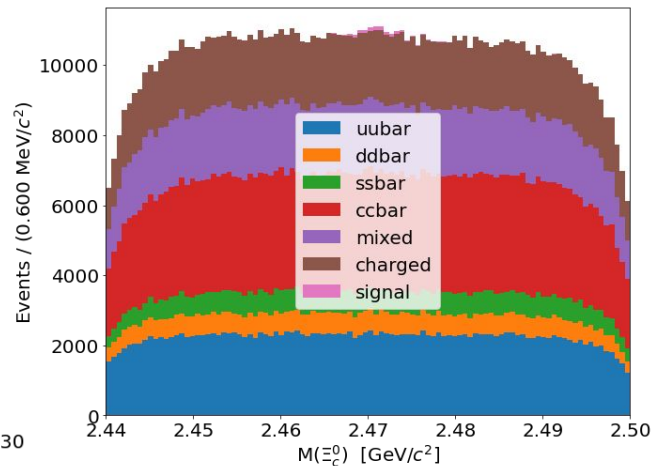
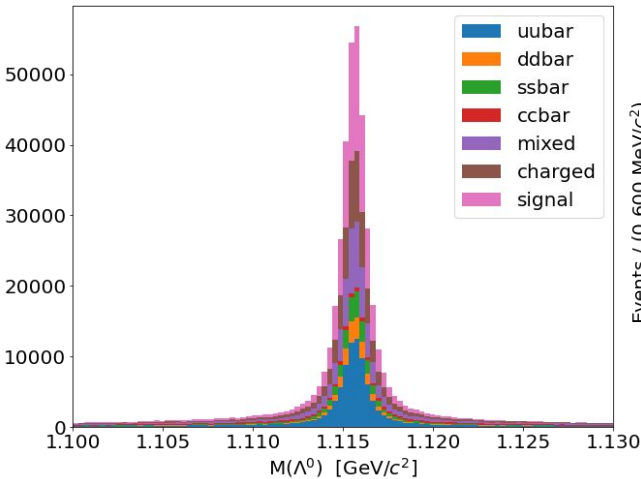
Number of signal = 1977
Number of bkg = 131303

Curved bkg?

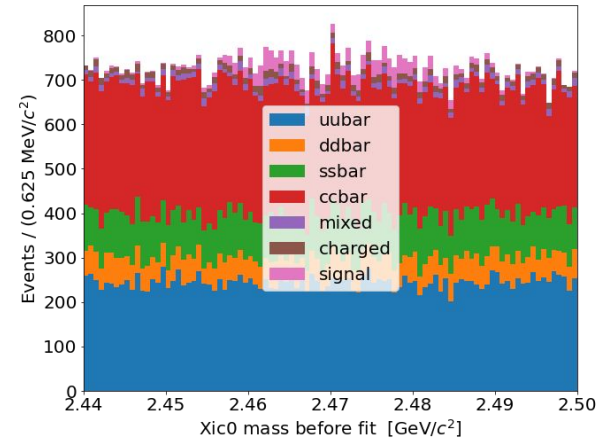


Checking if the curved background is due to constraining mass of Lambda:

- All the samples used to plot these results are produced using the script in which Lambda is not constrained and treeFit is not used in Lambda decay vertex. Bkg still curves down on both the end.
- Looks like the problem is not due to Lambda constraining.



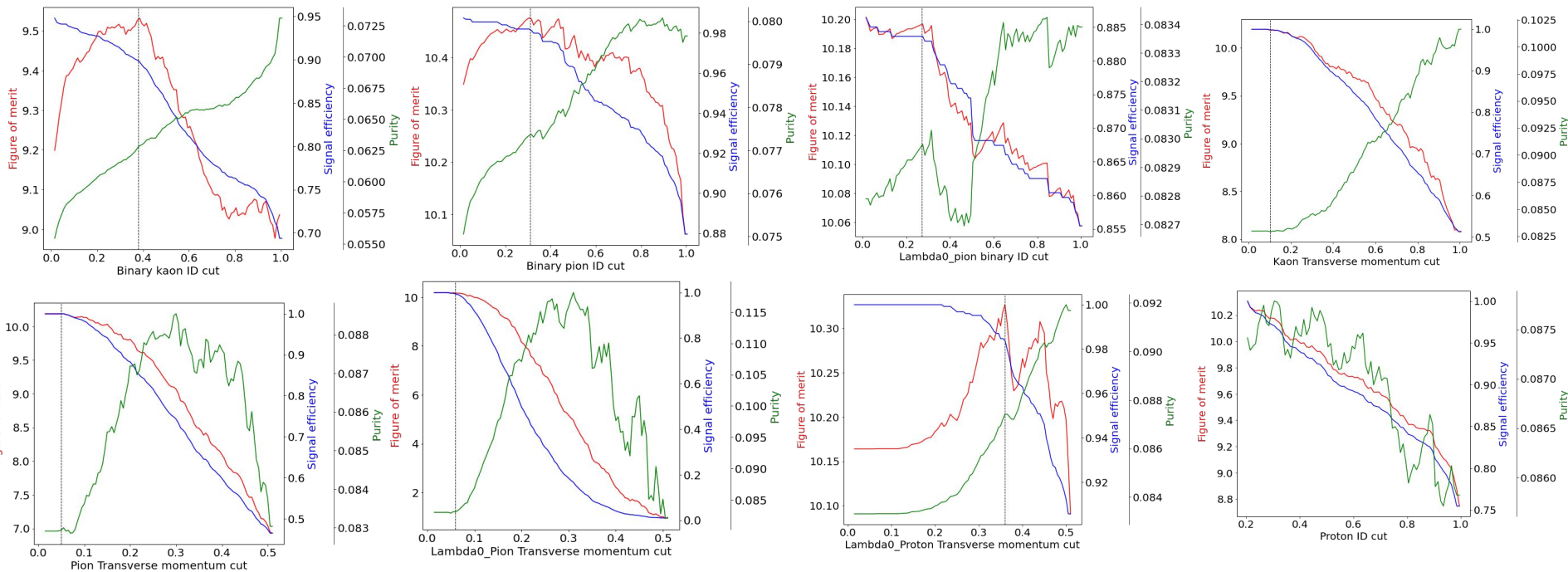
More likely that it is due to the fitting:



FOM



Base cut for Binary Kaon ID: $\text{Xi_chiProb} > 0.001$

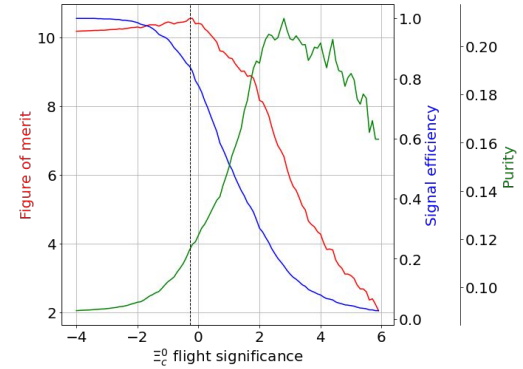
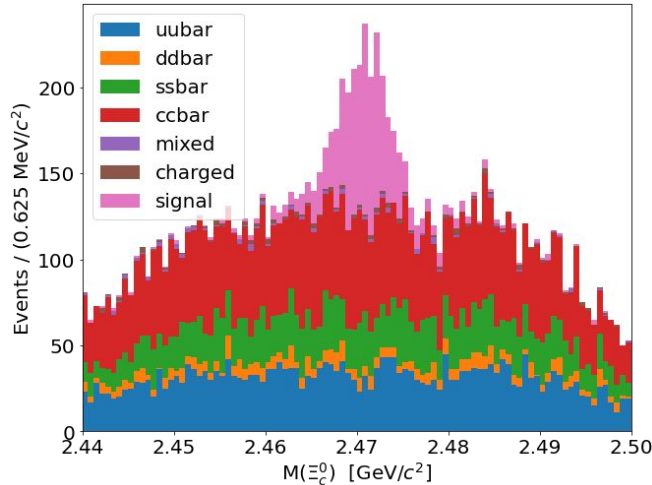


After all cuts

Final Cut on top of cuts from steering and skimming script given by FOM:

- $K_kaonID / (K_kaonID + K_pionID) > 0.38$
- $pi_pionID / (pi_pionID + pi_kaonID) > 0.31$
- $\Lambda_{0_p_protonID} > 0.2$ (Global proton ID)
- $\Lambda_{0_pi_pionID} / (\Lambda_{0_pi_pionID} + \Lambda_{0_pi_kaonID}) > 0.27$
- $K_pt > 0.1$ and $pi_pt > 0.05$
- $\Lambda_{0_pi_pt} > 0.07$
- $\Lambda_{0_p_pt} > 0.36$
- $\chi_{i_prob} > 0.001$

signal after cut = 1177
bkg after cut = 10598



After all cuts + $fs > 0$ (although FOM > -0.28)
signal after cut = 915
background after cut = 5831

