

UM-BNL meeting

Sept 21, 2021

Resonant substructure in the decay mode: $\Xi_c^0 \rightarrow \Lambda^0 K^- \pi^+$

Cut summary before analysis

$\Xi_c^0 \rightarrow \Lambda^0 K^- \pi^+$ 100 fb⁻¹ Generic MC (MC14ri_a)

- The **reconstruction** script:

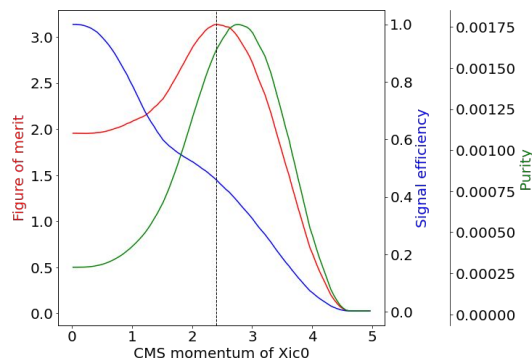
Basic cuts:

- thetaInCDCAcceptance
- nCDCHits > 20 for kaons and pions and protons
- dr < 1 cm and abs(dz) < 4 cm.
- protonID > 0.2
- Lambda0 mass constrained
- Xi_c0 mass range: 2.30 < M < 2.65
- Lambda0 reconstructed both from V0 and p π .
- Xi_c0 vertex: ipConstrained and daughters updated and Lambda0 mass constrained.

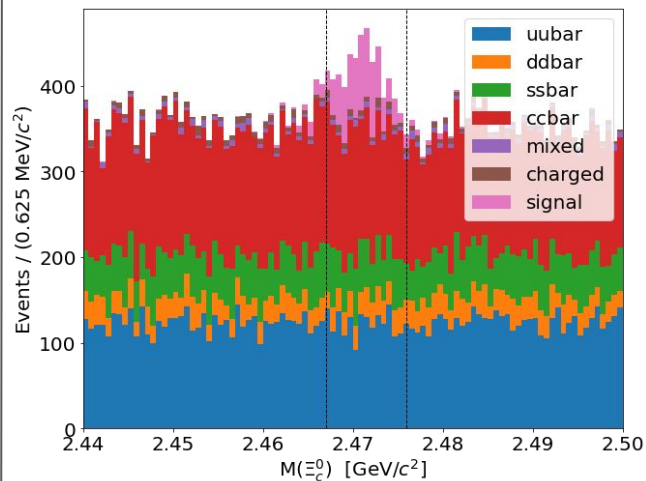
- **Skimming** script:
Xi_CMS_p > 2.4, protonID > 0.2 and nCDCHits > 20

protonID cut > 0.2 and nCDCHits > 20 were added on skimming script to address the protons and pions 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 Xi_CMS_p > 2.4



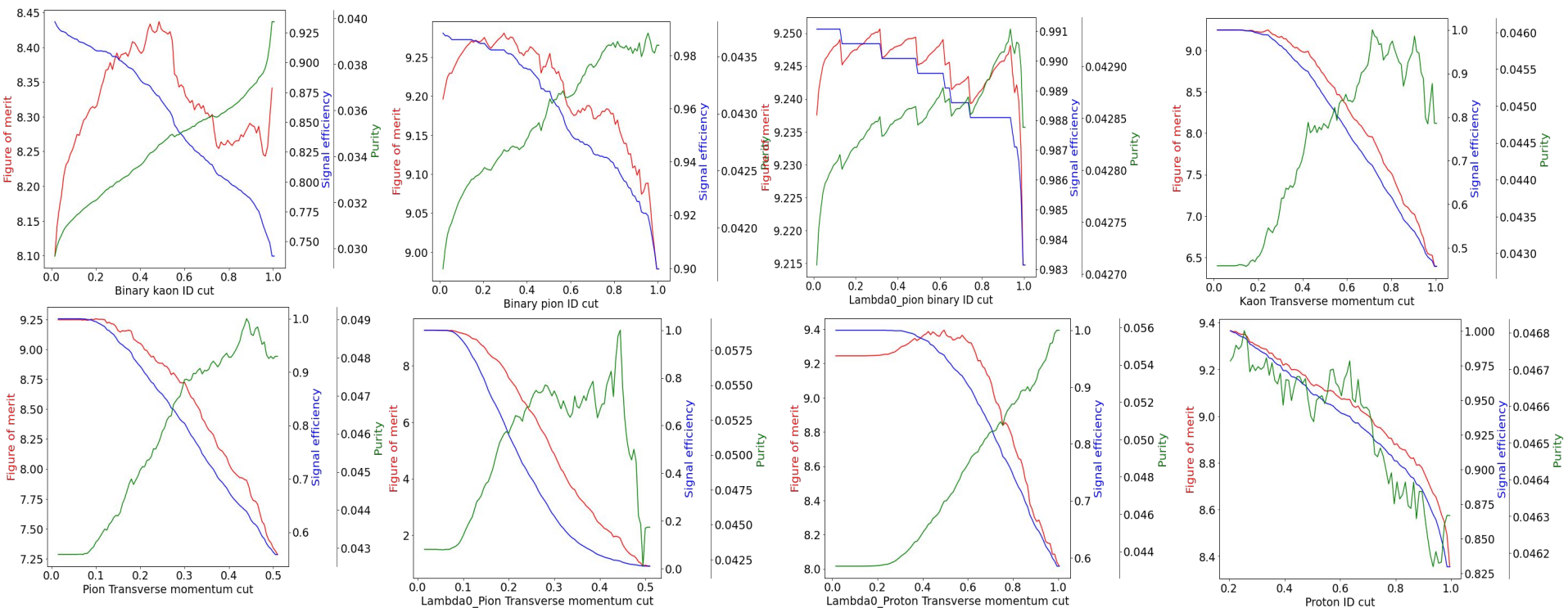
Before analysis, Xi_c0 mass distribution:
with Xi_chiProb > 0.001



signal = 1137
bkg = 92091

For signal region (2.467 - 2.476 GeV/c²):
signal = 897
bkg = 13964

FOM

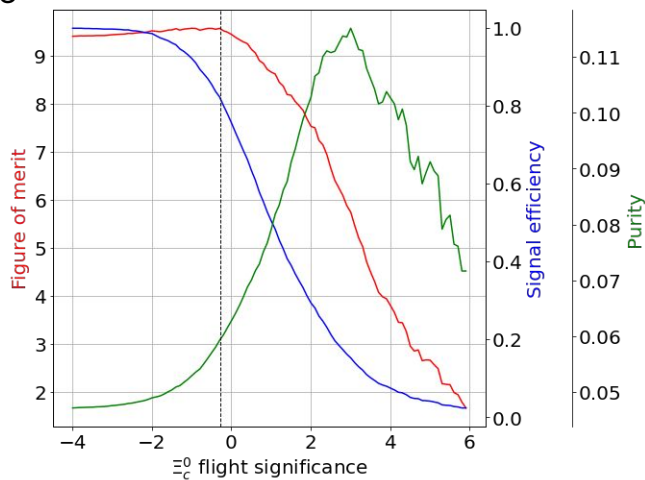


Optimal cuts suggested by these FOMs are used to extract signals while rejecting the background.

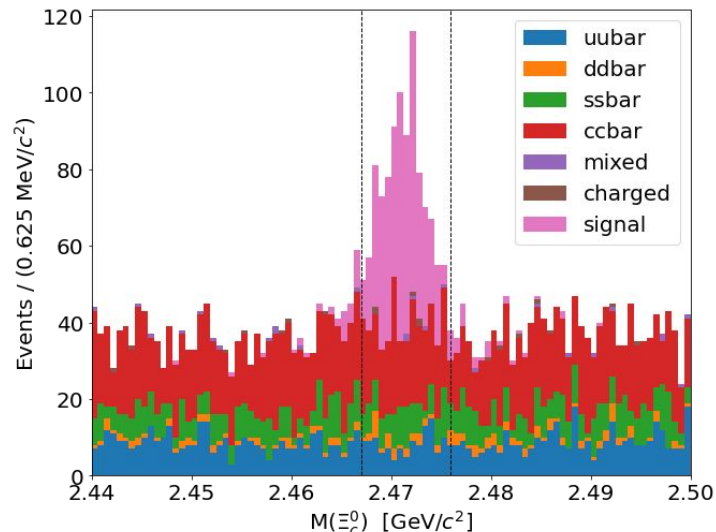
After all cuts

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

- $K_kaonID / (K_kaonID + K_pionID) > 0.49$
- $pi_pionID / (pi_pionID + pi_kaonID) > 0.3$
- $Lambda0_p_protonID > 0.26$ (Global proton ID)
- $Lambda0_pi_pionID / (Lambda0_pi_pionID + Lambda0_pi_kaonID) > 0.32$
- $K_pt > 0.1$ and $pi_pt > 0.1$
- $Lambda0_pi_pt > 0.06$
- $Lambda0_p_pt > 0.5$
- $Xi_chiProb > 0.001$



After all cuts + $fs > 0$
(although FOM > -0.28)



signal after cut = 560

bkg after cut = 3602

In the signal region:

signal after cut = 492

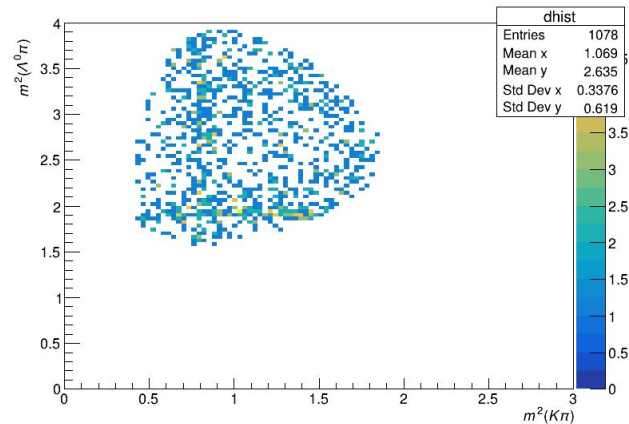
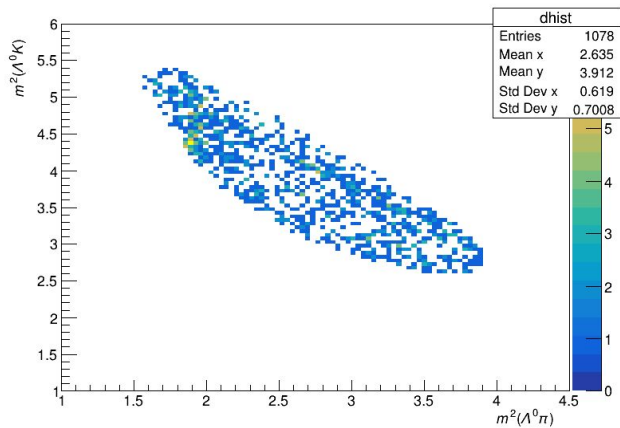
bkg after cut = 586

Signal retention = 54.8%

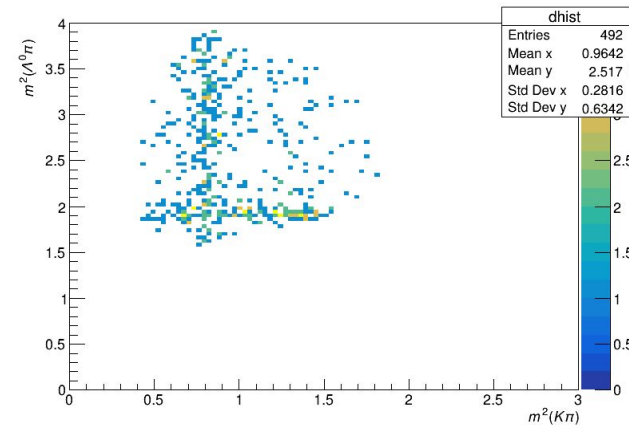
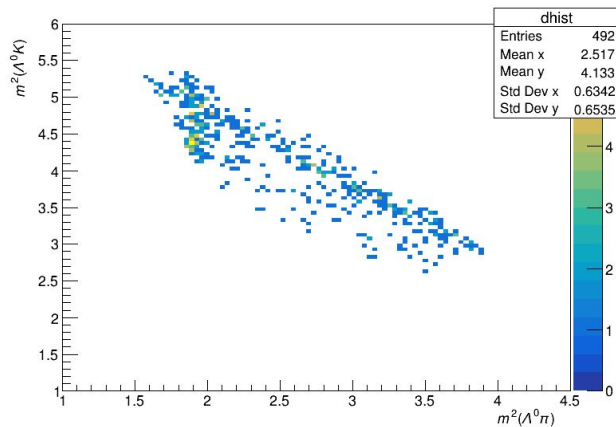
Bkg rejection = 95.8%

Dalitz plots

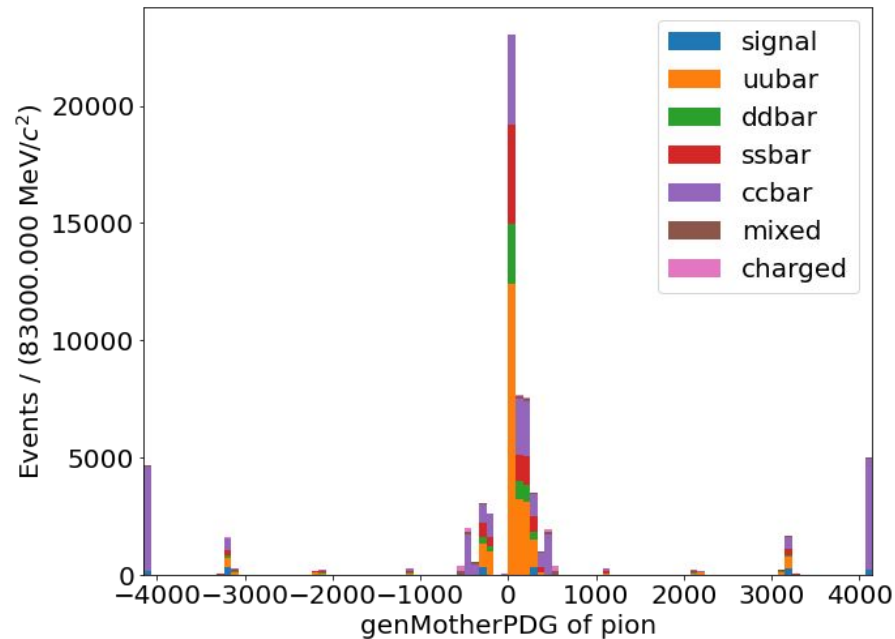
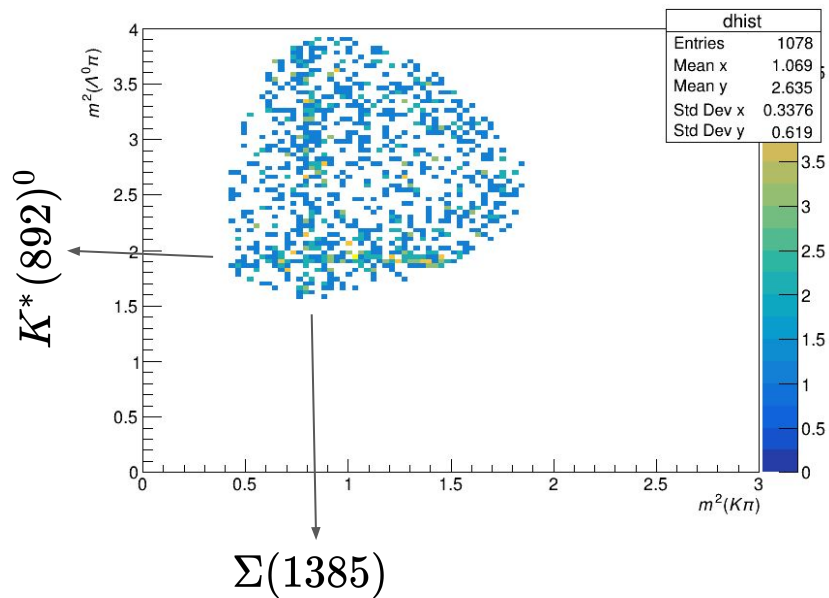
Reconstructed signal in the signal region along with bkg.



$\Xi_{i,c0}$ isSignal in the signal region



Resonance bands



Number of signal from $\Sigma(1385)$ or Σ^{*+} = 382 [PDG = 3224]
Number of signal from $K^*(892)^0$ = 414 [PDG = 313]