

Update on Kinematic Vertex Fitter: Comparison of Trunk Revisions

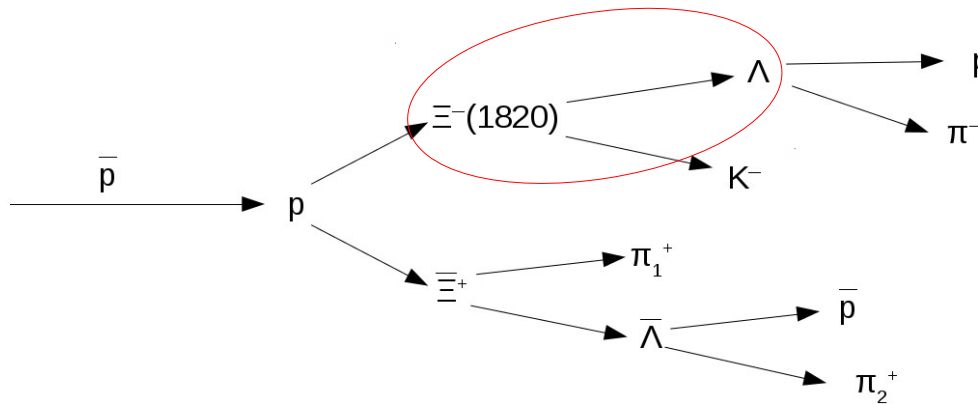
PANDA – CM @ GSI, June 7th 2016 | Jennifer Pütz

Outline

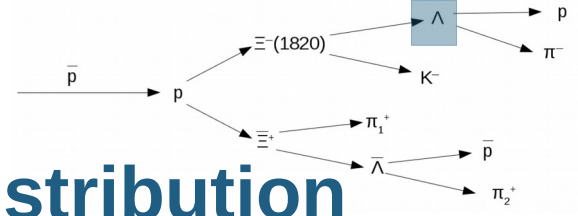
- Simulation & trunk revisions
- Probability distributions
- Pull distributions
- Reconstruction efficiencies
- Summary & Outlook

Simulation & trunk revisions

- 1.5 million events for $\bar{p}p \rightarrow \Xi(1820)^- \Xi^+$
- Beam momentum: $p = 4.6 \text{ GeV}/c$

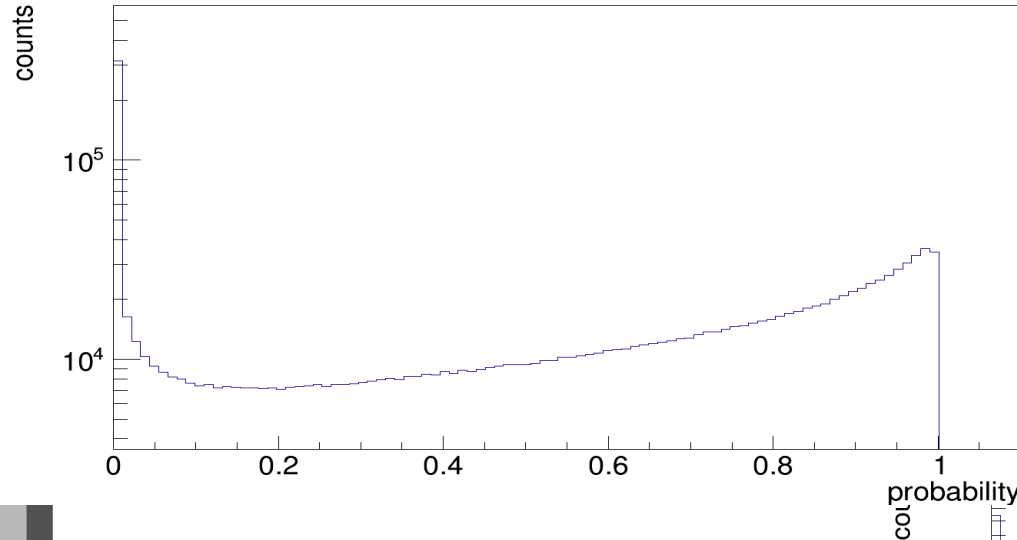


- “Old” trunk revision: 28555
- “New” trunk revision: 28958
- Ideal pattern recognition & ideal PID

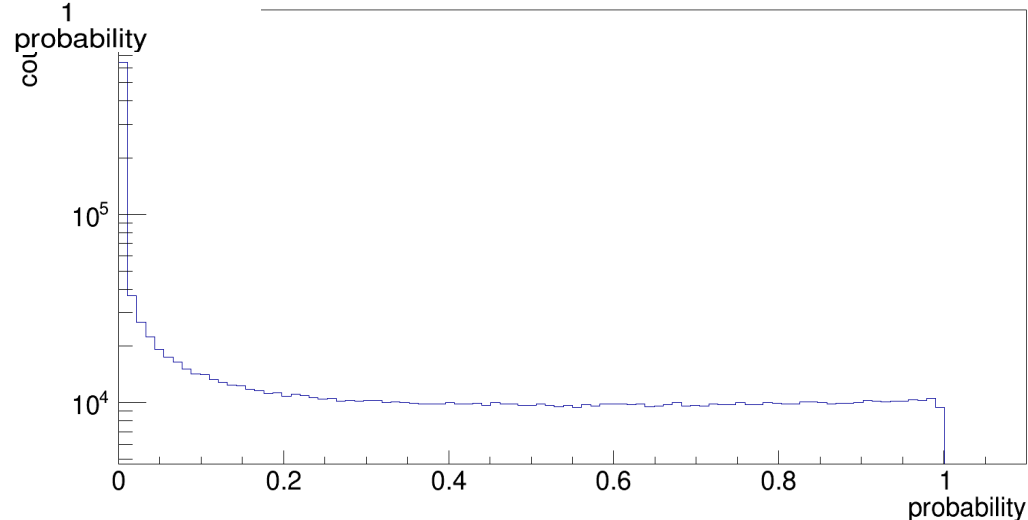


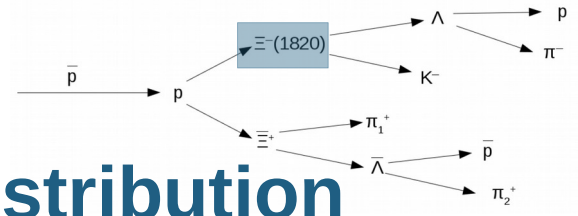
Vertex Fit Probability Distribution for Λ

Old trunk revision



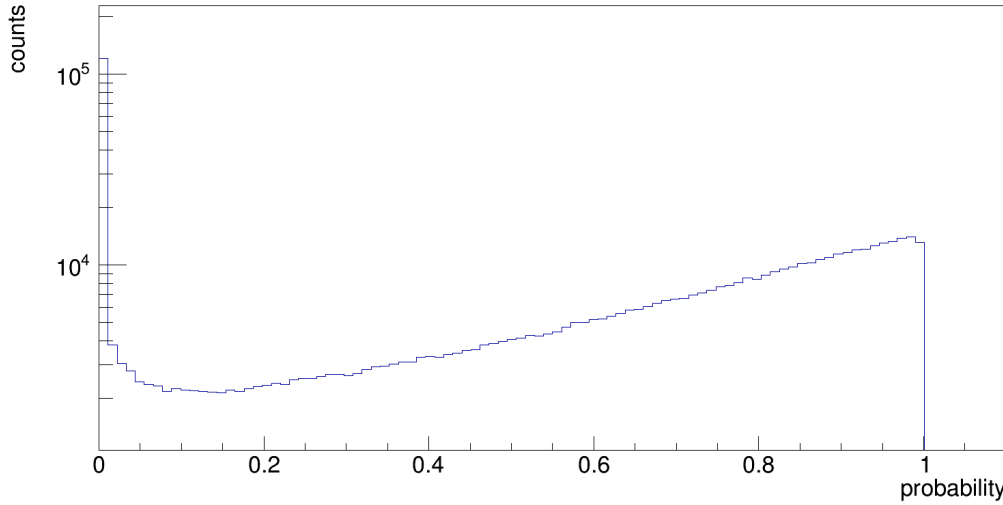
New trunk revision



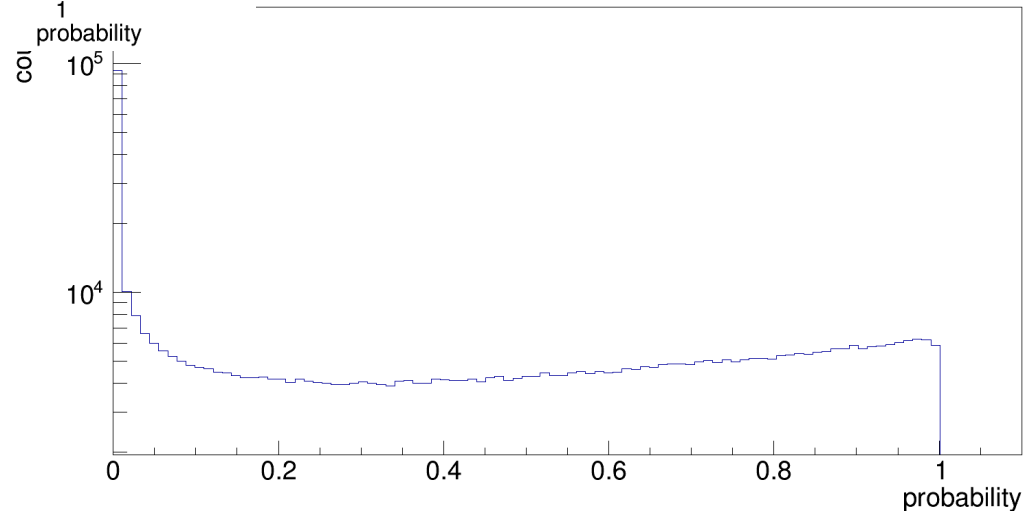


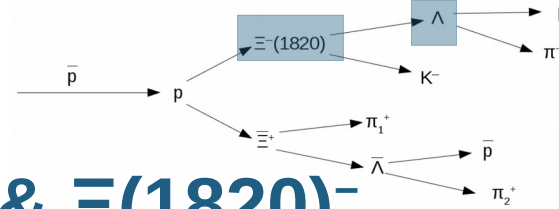
Vertex Fit Probability Distribution for $\Xi(1820)^-$

Old trunk revision



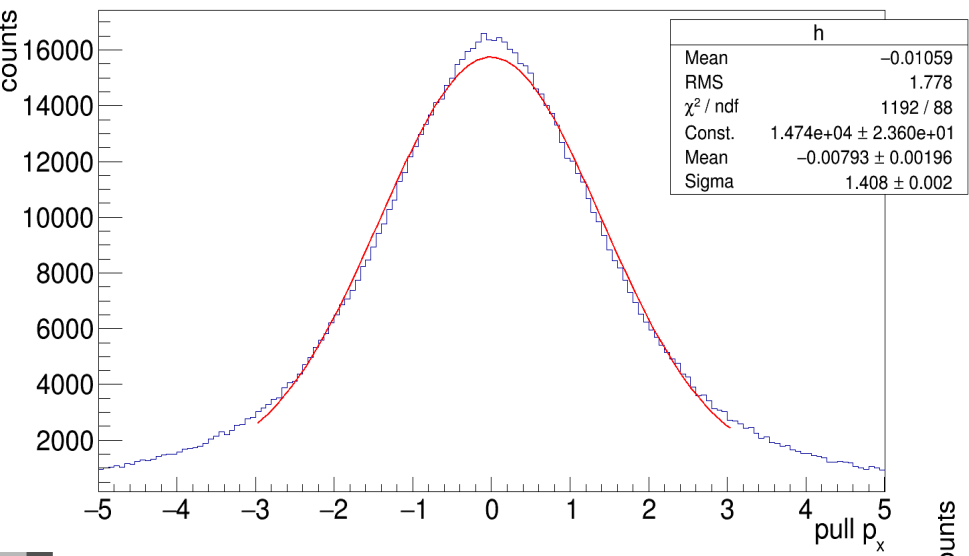
New trunk revision





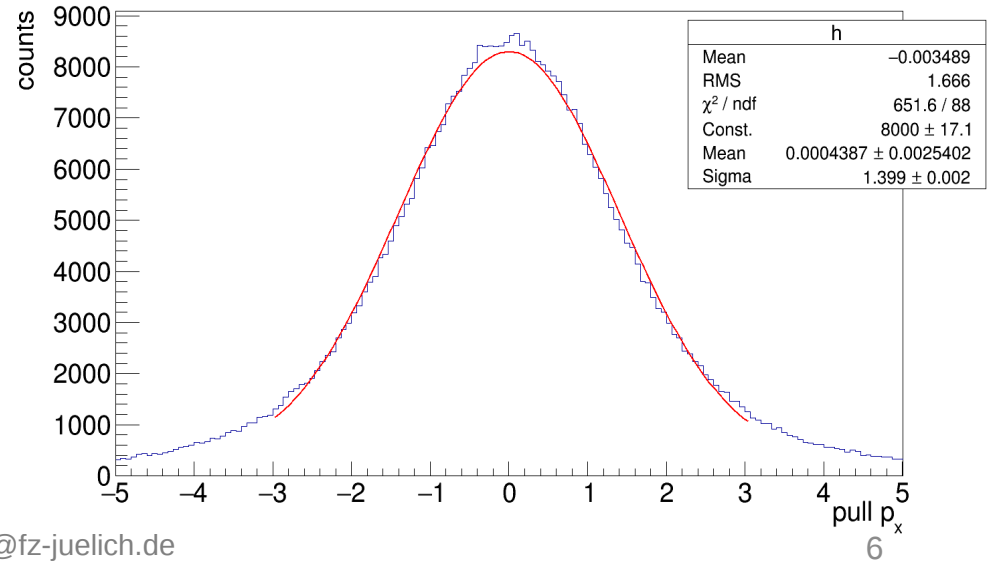
Pull Distributions for Λ & $\Xi(1820)^-$

Lambda



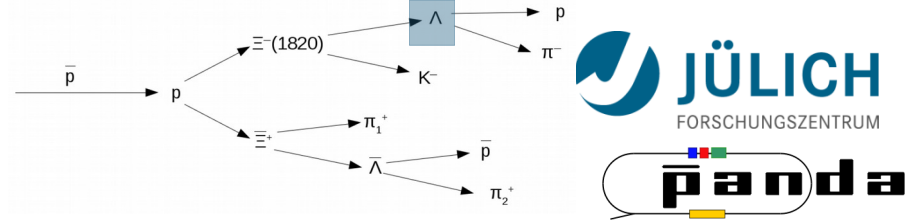
- After vertex fit
- “New” trunk revision

$\Xi(1820)^-$

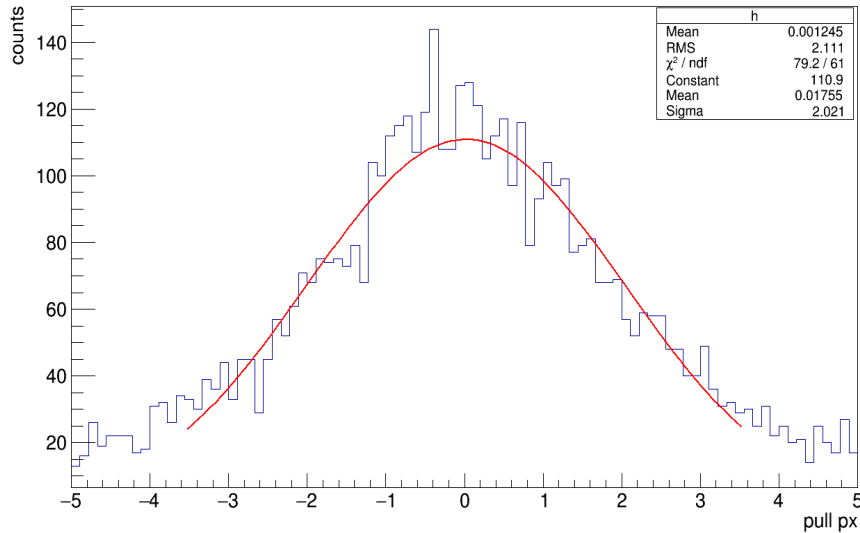


Further investigations with smaller sample of 10k events

Pull Distributions for Λ Before and After Vertex Fit

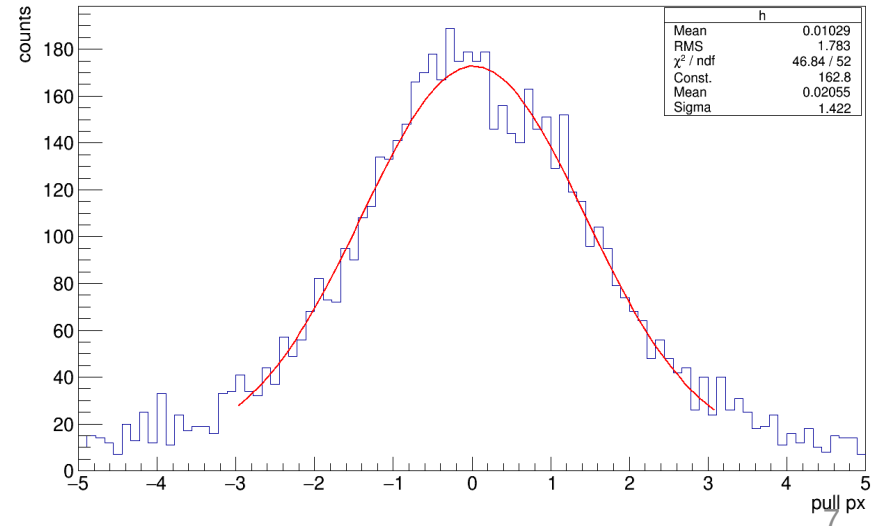


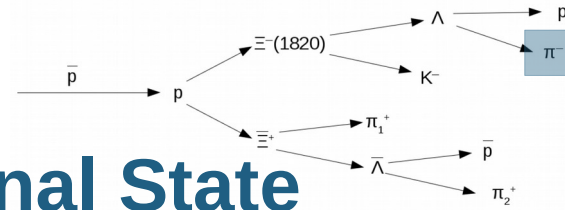
Before vtx fit



Sample with 10k events

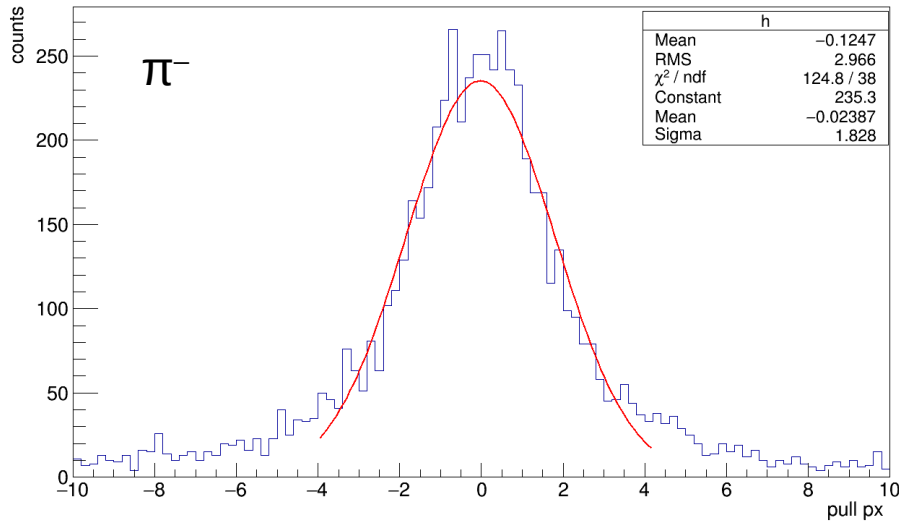
After vtx fit





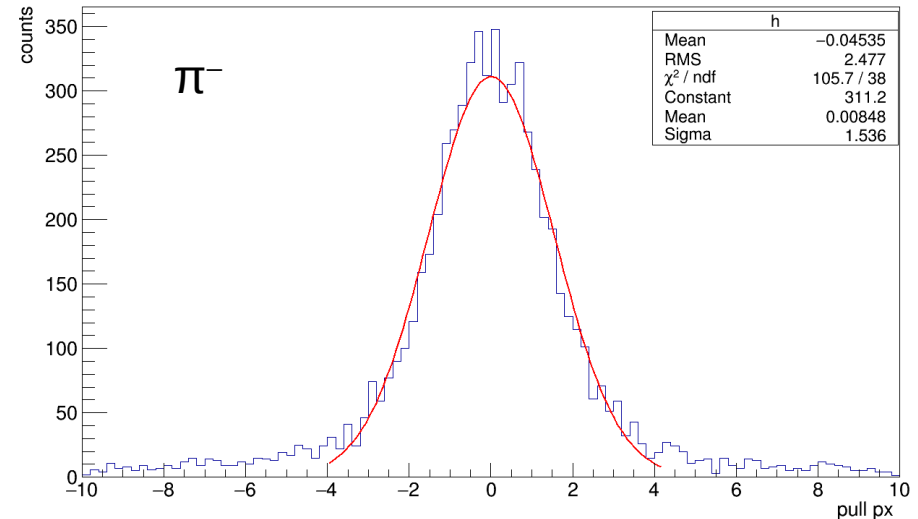
Pull Distributions for Final State Daughters of Λ

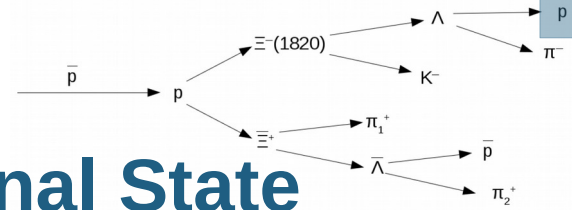
Before vtx fit



Sample with 10k events

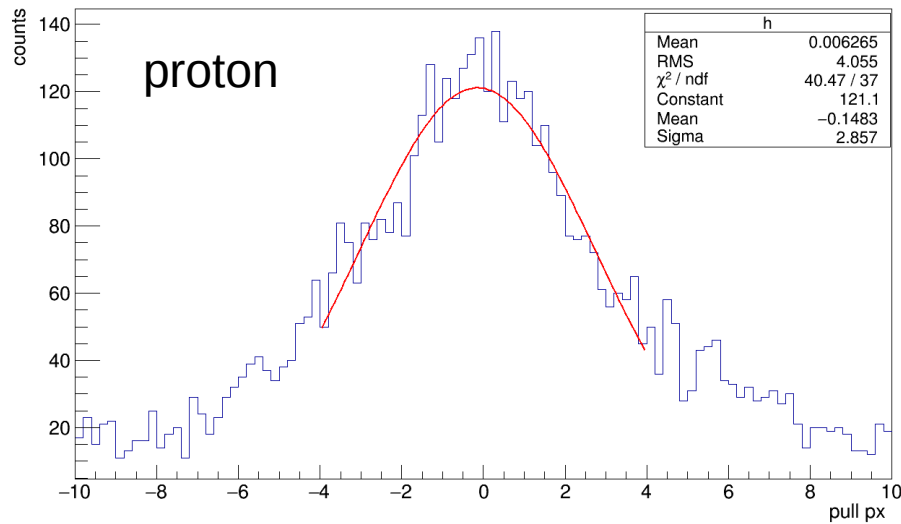
After vtx fit





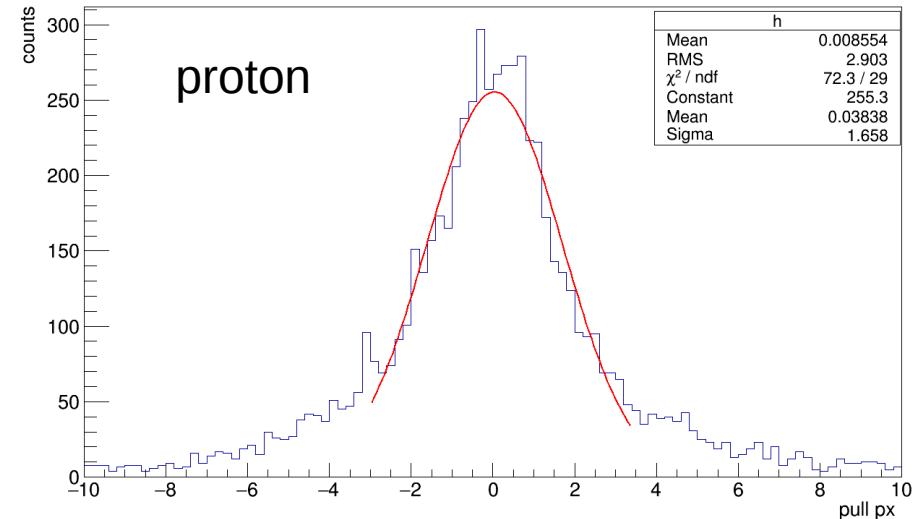
Pull Distributions for Final State Daughters of Λ

Before vtx fit



Sample with 10k events

After vtx fit



Reconstruction Efficiencies

Old trunk revision		New trunk revision	
Particle type	Reco. eff*	Particle type	Reco. eff*
π^-	83 %	π^-	87 %
$\pi^+(\Lambda)$	83 %	$\pi^+(\Lambda)$	88 %
$\pi^+(\bar{\Lambda})$	81 %	$\pi^+(\bar{\Lambda})$	84 %
K^-	79 %	K^-	79 %
ρ	84 %	ρ	84 %
$\bar{\rho}$	78 %	$\bar{\rho}$	78 %
Λ	40 %	Λ	34 %
$\bar{\Lambda}$	33 %	$\bar{\Lambda}$	26 %
Ξ^+	18 %	Ξ^+	13 %
$\Xi(1820)^-$	32 %	$\Xi(1820)^-$	28 %
$\Xi^+ \Xi(1820)^-$	4.7 %	$\Xi^+ \Xi(1820)^-$	2.2 %

* calculated with MC match candidate; without BRs

Summary & Outlook

- Issue in probability distributions improved in “new” trunk revision
 - Solved for Λ
 - $\Xi(1820)^-$: Not vanished, but better
- Pull distributions are still incorrect \Rightarrow Work in progress
- Reconstruction efficiencies for composite states are significantly lower in the “new” trunk revision \Rightarrow ongoing investigations!

Back up

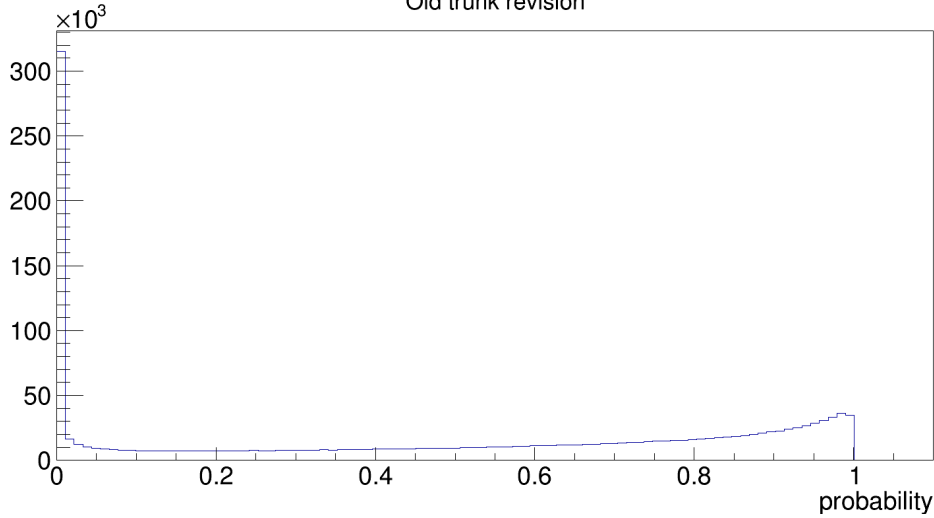
What is vertex fitting?

- Goal: Find the decay point of a particle, which decays into two or more particles (either charged or having charged daughters)
- Vertex fitter is an algorithm to determine a point which is as close as possible to the true decay point
- Different methods; for example:
 - 1) Kinematic vertex fitting
 - 2) Kalman vertex fitting
- **Kinematic vertex fitting**: mathematical procedure using the kinematic constraints find the common point
- **Kalman vertex fitting**: based on 5 helix-parameters of the particle tracks

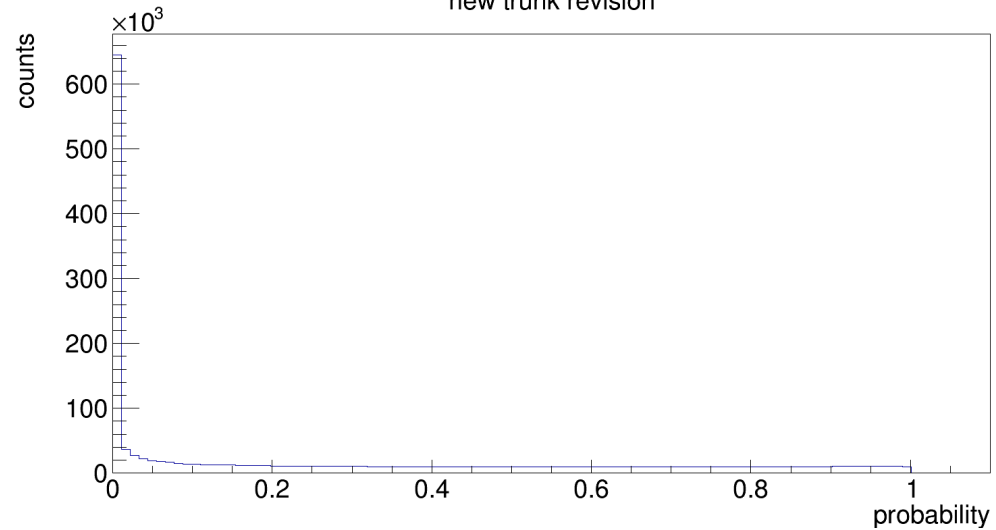
Probability Distribution for Λ

counts

Old trunk revision

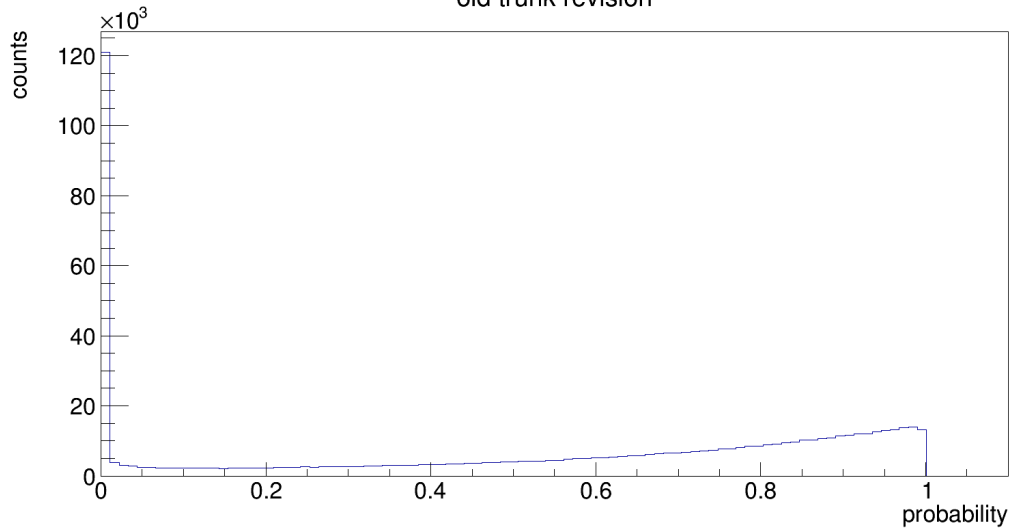


new trunk revision

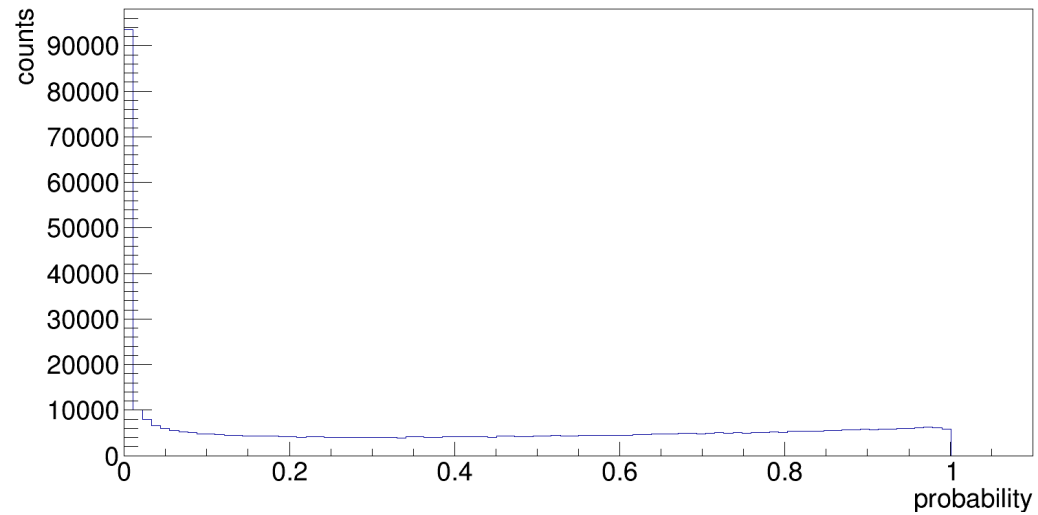


Probability Distribution for $\Xi(1820)^-$

old trunk revision

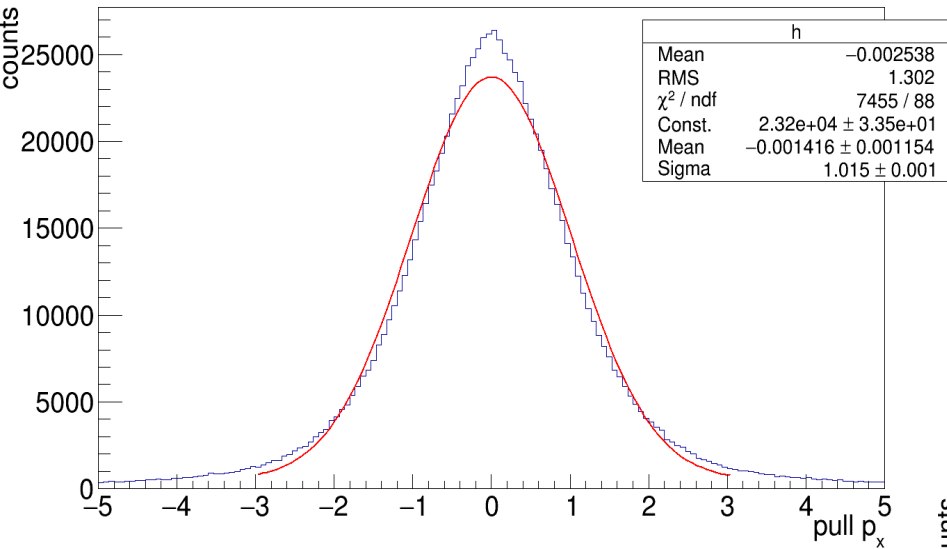


new trunk revision



Pull Distributions for Λ & $\Xi(1820)^-$

Lambda



Old trunk revision

Xi

