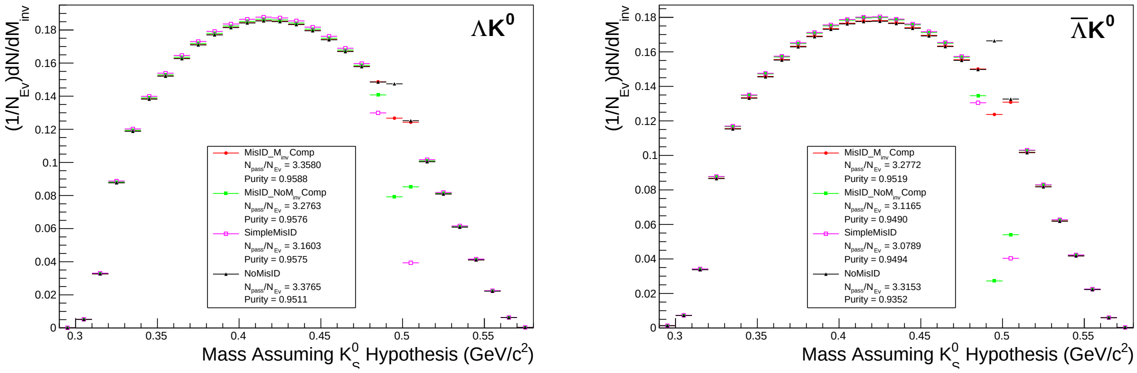
0.0.1 Λ Reconstruction

The following cuts were used to select good Λ ($\bar{\Lambda}$) candidates:

1. Daughter Particle Cuts
   (a) Cuts Common to Both Daughters
      i. $|\eta| < 0.8$
      ii. SetTPCnclsDaughters(80)
      iii. SetStatusDaughters(AliESDtrack::kTPCrefit)
      iv. DCA πp Daughters < 0.4 cm
   (b) Pion Specific Daughter Cuts
      i. $p_{\mathrm{T}} > 0.16$ GeV/c
      ii. DCA to prim vertex > 0.3 cm
      iii. TPC and TOF Nσ Cuts
         A. $p < 0.5$ GeV/c : N$\sigma_{\mathrm{TPC}} < 3$
         B. $p > 0.5$ GeV/c :
            – if TOF & TPC available: N$\sigma_{\mathrm{TPC}} < 3$ & N$\sigma_{\mathrm{TOF}} < 3$
            – else N$\sigma_{\mathrm{TOF}} < 3$
   (c) Proton Specific Daughter Cuts
      i. $p_{\mathrm{T}} > 0.5(p)$ $[0.3(\bar{p})]$ GeV/c
      ii. DCA to prim vertex > 0.1 cm
      iii. TPC and TOF Nσ Cuts
         A. $p < 0.8$ GeV/c : N$\sigma_{\mathrm{TPC}} < 3$
         B. $p > 0.8$ GeV/c :
            – if TOF & TPC available: N$\sigma_{\mathrm{TPC}} < 3$ & N$\sigma_{\mathrm{TOF}} < 3$
            – else N$\sigma_{\mathrm{TOF}} < 3$
2. V0 Cuts
   (a) $|\eta| < 0.8$
   (b) $p_{\mathrm{T}} > 0.4$ GeV/c
   (c) $|m_{\mathrm{inv}} - m_{\mathrm{PDG}}| < 3.8$ MeV
   (d) DCA to prim. vertex < 0.5 cm
   (e) Cosine of pointing angle > 0.9993
   (f) OnFlyStatus = false
   (g) Decay Length < 60 cm
3. Shared Daughter Cut for V0 Collection
   – Iterate through V0 collection to ensure that no daughter is used in more than one V0 candidate

Figure 1a shows the mass assuming K^0_S hypothesis for the Λ collection, i.e. assume the daughters are $\pi^+\pi^-$ instead of $\pi^+\bar{p}^-$. Figure 1b is a similar plot, but is for the $\bar{\Lambda}$ collection, i.e. assume the daughters are $\pi^+\pi^-$ instead of $\pi^+\bar{p}^-$. The K^0_S contamination is visible, although not profound, in both in the slight peaks around m_{inv} = 0.497 GeV/c^2. If one simply cuts out the entire peak, good Λ particles will be lost. Ideally, the Λ selection and K^0_S misidentification cuts are selected such that the peak is removed



(a) Mass assuming K^0_S-hypothesis for Λ collection, i.e. assume the daughters are $\pi^+\pi^-$ instead of $p^+\pi^-$.

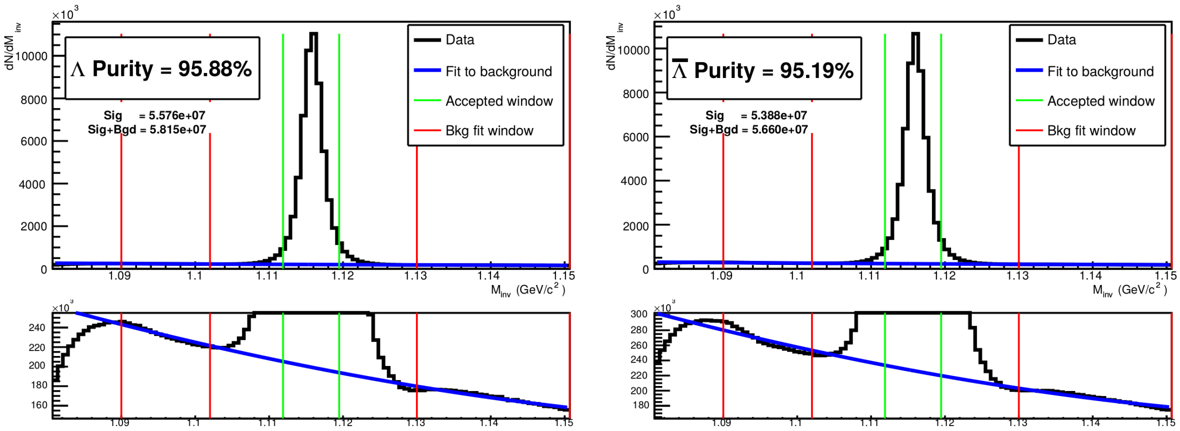
(b) Mass assuming K^0_S-hypothesis for $\bar{\Lambda}$ collection, i.e. assume the daughters are $\pi^+\pi^-$ instead of $\pi^+\bar{p}^-$.

Fig. 1: Mass assuming K^0_S-hypothesis for V0 candidates passing all Λ (1a) and $\bar{\Lambda}$ (1b) cuts. The "NoMisID" distribution (black triangles) uses the V0 finder without any attempt to remove misidentified K^0_S. The slight peak in the "NoMisID" distribution around $m_{\rm inv}$ = 0.5 GeV/c^2 contains misidentified K^0_S particles in our $\Lambda(\bar{\Lambda})$ collection. "SimpleMisID" (pink squares) simply cuts out the entire peak, which throws away some good Λ and $\bar{\Lambda}$ particles. "MisID_NoM$_{\rm inv}$Comp" (green squares) uses the misidentification cut outlined in the text, but does not utilize the invariant mass comparison method. "MisID_M$_{\rm inv}$Comp" (red circles) utilizes the full misidentification methods, and is currently used for this analysis. "N$_{pass}$/N$_{ev}$" is the total number of $\Lambda(\bar{\Lambda})$ particles found, normalized by the total number of events. The purity of the collection is also listed.

from this plot while leaving the distribution continuous. To attempt to remove these K^0_S contaminations without throwing away good Λ and $\bar{\Lambda}$ particles, the following misidentification cuts are imposed; a $\Lambda(\bar{\Lambda})$ candidate is rejected if all of the following criteria are satisfied:

- $\left| m_{\rm inv,\ K^0_S\ Hypothesis} - m_{\rm PDG,\ K^0_S} \right| < 9.0$ MeV/c^2
- Positive and negative daughters pass π daughter cut implemented for K^0_S reconstruction
- $\left| m_{\rm inv,\ K^0_S\ Hypothesis} - m_{\rm PDG,\ K^0_S} \right| < \left| m_{\rm inv,\ \Lambda(\bar{\Lambda})\ Hypothesis} - m_{\rm PDG,\ \Lambda(\bar{\Lambda})} \right|$

Figure 2 shows the invariant mass ($m_{\rm inv}$) distribution of all $\Lambda(\bar{\Lambda})$ candidates immediately before the final invariant mass cut. These distributions are used to calculate the collection purities. The Λ and $\bar{\Lambda}$ purities are found to be: Purity(Λ) $\approx$ Purity($\bar{\Lambda}$) $\approx$ 95%.



(a) Λ Purity

(b) $\bar{\Lambda}$ Purity

Fig. 2: Invariant mass (m_{inv}) distribution of all Λ (a) and $\bar{\Lambda}$ (b) candidates immediately before the final invariant mass cut. The bottom figures are zoomed to show the background with fit. The vertical green lines represent the m_{inv} cuts used in the analyses, the red vertical lines delineate the region over which the background was fit, and the blue line shows the background fit. These distributions are used to calculate the collection purities, Purity(Λ) $\approx$ Purity($\bar{\Lambda}$) $\approx$ 95%.