0.0.1 K_S^0 Reconstruction

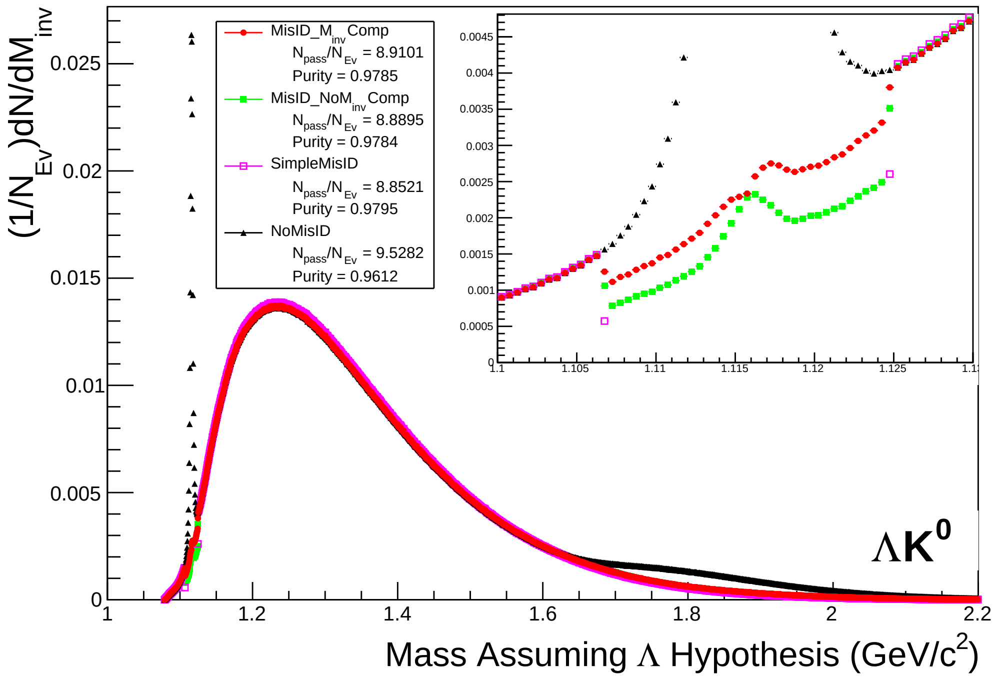
The following cuts were used to select good K_S^0 candidates:

1. Pion Daughter Cuts
   (a) $|\eta| < 0.8$
   (b) SetTPCnclsDaughters(80)
   (c) SetStatusDaughters(AliESDtrack::kTPCrefic)
   (d) SetMaxDcaV0Daughters(0.3)
   (e) $p_T > 0.15$
   (f) DCA to prim vertex > 0.3
2. K_S^0 Cuts
   (a) $|\eta| < 0.8$
   (b) $p_T > 0.2$
   (c) $m_{PDG}-$ 13.677 MeV $< m_{inv} < m_{PDG}+$ 2.0323 MeV
   (d) Cosine of pointing angle > 0.9993
   (e) OnFlyStatus = false
   (f) Decay Length < 30 cm

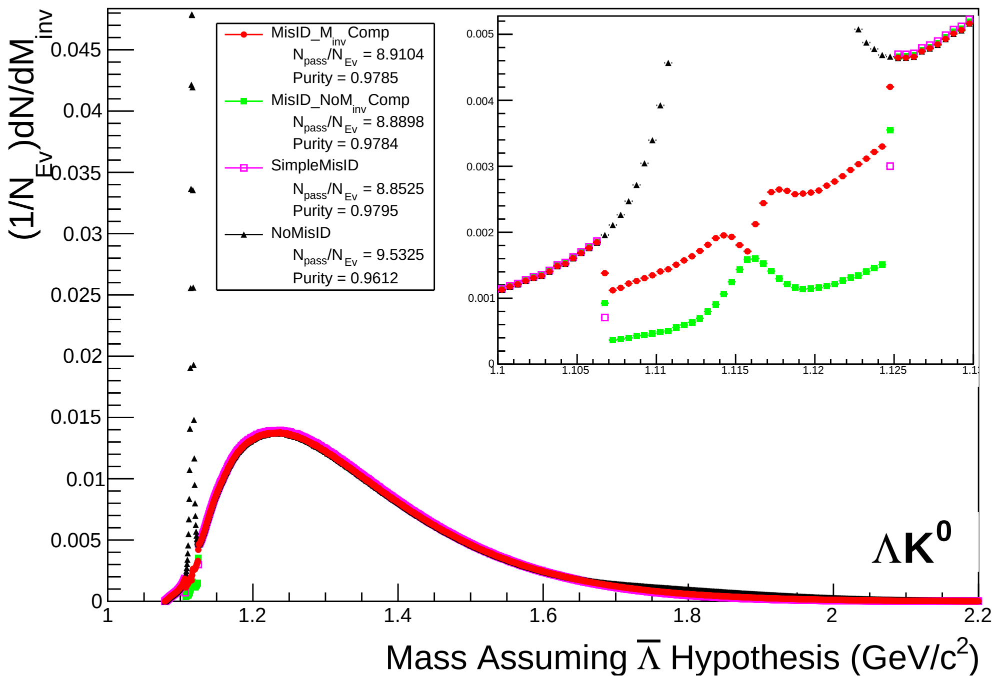
As can be seen in Figure 1, some misidentified Λ and $\bar{\Lambda}$ particles contaminate our K_S^0 sample. Figure 1a shows the mass assuming Λ-hypothesis for the K_S^0 collection, i.e. assume the daughters are $p^+\pi^-$ instead of $\pi^+\pi^-$. Figure 1b is similar, but shows the mass assuming $\bar{\Lambda}$ hypothesis for the collection, i.e. assume the daughters are $\pi^+\bar{p}^-$ instead of $\pi^+\pi^-$. The Λ contamination can be seen in 1a, and the $\bar{\Lambda}$ contamination in 1b, in the peaks around m_{inv} = 1.115 GeV/c^2. Additionally, the $\bar{\Lambda}$ contamination is visible in Figure 1a, and the Λ contamination visible in Figure 1b, in the region of excess around 1.65 $< m_{inv} <$ 2.1 GeV/c^2. This is confirmed as the number of misidentified Λ particles in the sharp peak of Figure 1a (misidentified $\bar{\Lambda}$ particles in the sharp peak of Figure 1b) approximately equals the excess found in the 1.65 $< m_{inv} <$ 2.1 GeV/c^2 region of Figure 1a (Figure 1b).

The peaks around $m_{inv} = 1.115$ GeV/c^2 in Figure 1 contain both misidentified Λ ($\bar{\Lambda}$) particles and good K_S^0. If one simply cuts out the entire peak, some good K_S^0 particles will be lost. Ideally, the K_S^0 selection and $\Lambda(\bar{\Lambda})$ misidentification cuts can be selected such that the peak is removed from this plot while leaving the distribution continuous. To attempt to remove these Λ and $\bar{\Lambda}$ contaminations without throwing away good K_S^0 particles, the following misidentification cuts are imposed; a K_S^0 candidate is rejected if all of the following criteria are satisfied:

- $|m_{inv,\ \Lambda(\bar{\Lambda})\ Hypothesis} - m_{PDG,\ \Lambda(\bar{\Lambda})}| < 9.0$ MeV/c^2
- Positive daughter passes $p^+(\pi^+)$ daughter cut implemented for $\Lambda(\bar{\Lambda})$ reconstruction
- Negative daughter passes $\pi^-(\bar{p}^-)$ daughter cut implemented by $\Lambda(\bar{\Lambda})$ reconstruction



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



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

Fig. 1: Mass assuming Λ-hypothesis (1a) and $\bar{\Lambda}$-hypothesis (1b) for K^0_S collection. The "NoMisID" distribution (black triangles) uses the V0 finder without any attempt to remove misidentified Λ and $\bar{\Lambda}$. The peak in the "NoMisID" distribution around m_{inv} = 1.115 GeV/c^2 contains misidentified Λ (1a) and $\bar{\Lambda}$ (1b) particles in our K^0_S collection. "SimpleMisID" (pink squares) simply cuts out the entire peak, which throws away some good K^0_S particles. "MisID_NoM$_{inv}$Comp" (green squares) uses the misidentification cut outlined in the text, but does not utilize the invariant mass comparison method. "MisID_M$_{inv}$Comp" (red circles) utilizes the full misidentification methods, and is currently used for this analysis. "N$_{pass}$/N$_{ev}$" is the total number of K^0_S particles found, normalized by the total number of events. The purity of the collection is also listed. Also note, the relative excess of the "NoMisID" distribution around $1.65 < m_{inv} < 2.1$ GeV/c^2 shows misidified $\bar{\Lambda}$ (1a) and Λ (1b) particles in our K^0_S collection.

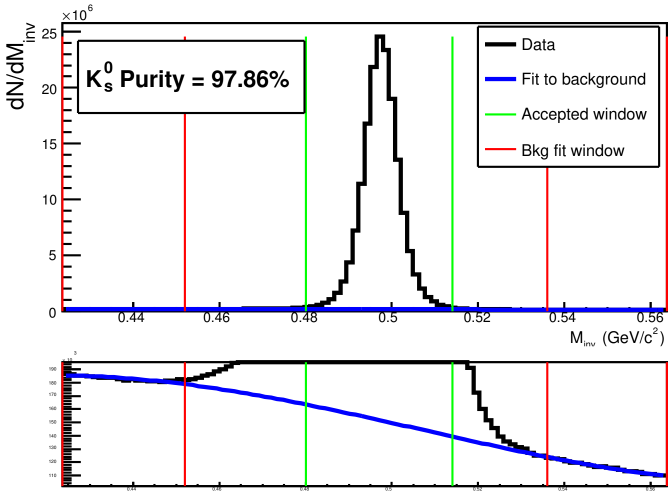


Fig. 2: Invariant mass (M_{inv}) distribution of all K_S^0 candidates immediately before the final invariant mass cut. This distribution is used to calculate the collection purity, Purity(K_S^0) $\approx$ 98%.