

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

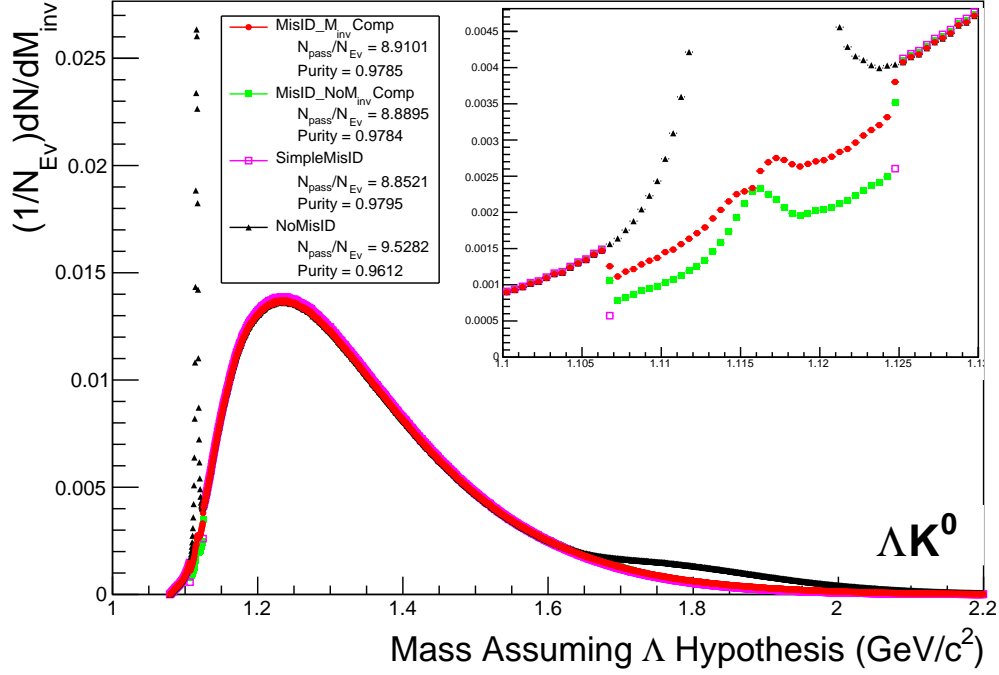
2. K_S^0 Cuts

- (a) $|\eta| < 0.8$
- (b) $p_T > 0.2$
- (c) $m_{PDG} - 13.677 \text{ MeV} < m_{inv} < m_{PDG} + 2.0323 \text{ MeV}$
- (d) Cosine of pointing angle > 0.9993
- (e) OnFlyStatus = false
- (f) Decay Length $< 30 \text{ cm}$

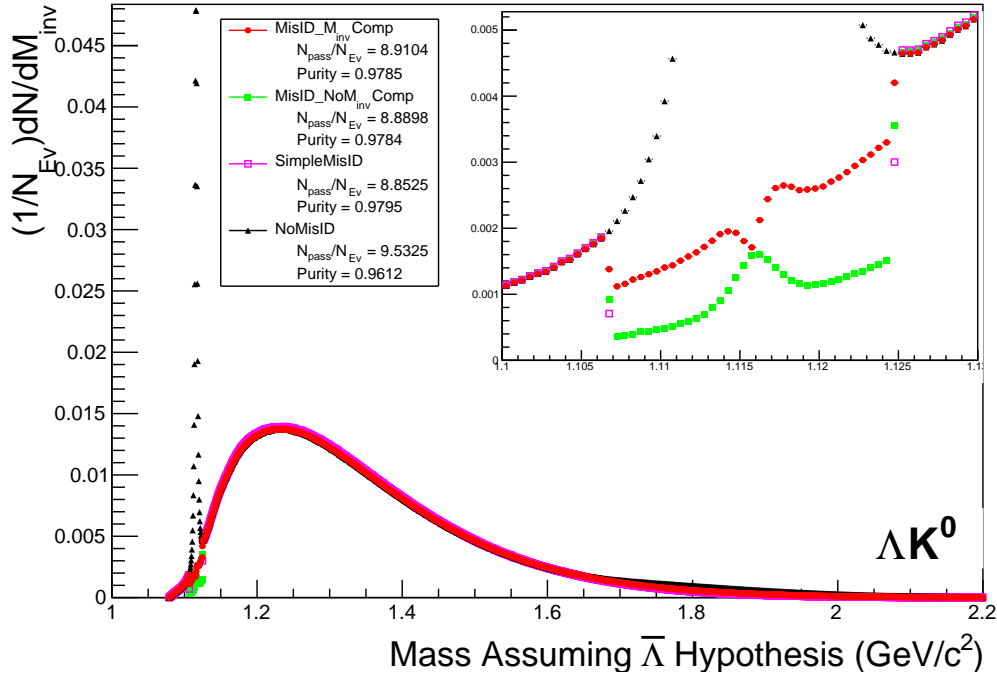
As can be seen in Figure 1, some misidentified Λ and $\bar{\Lambda}$ particles contaminate our K_S^0 sample. Figure 1a shows the mass assuming Λ -hypothesis for the K_S^0 collection, i.e. assume the daughters are $p^+\pi^-$ instead of $\pi^+\pi^-$. Figure 1b is similar, but shows the mass assuming $\bar{\Lambda}$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

The peaks around $m_{inv} = 1.115 \text{ GeV}/c^2$ 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:

- $|m_{inv, \Lambda(\bar{\Lambda}) \text{ Hypothesis}} - m_{PDG, \Lambda(\bar{\Lambda})}| < 9.0 \text{ MeV}/c^2$
- 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_S^0 collection, i.e. assume the daughters are $p^+\pi^-$ instead of $\pi^+\pi^-$.



(b) Mass assuming $\bar{\Lambda}$ -hypothesis for K_S^0 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_S^0 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_S^0 collection. “SimpleMisID” (pink squares) simply cuts out the entire peak, which throws away some good K_S^0 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_S^0 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_S^0 collection.

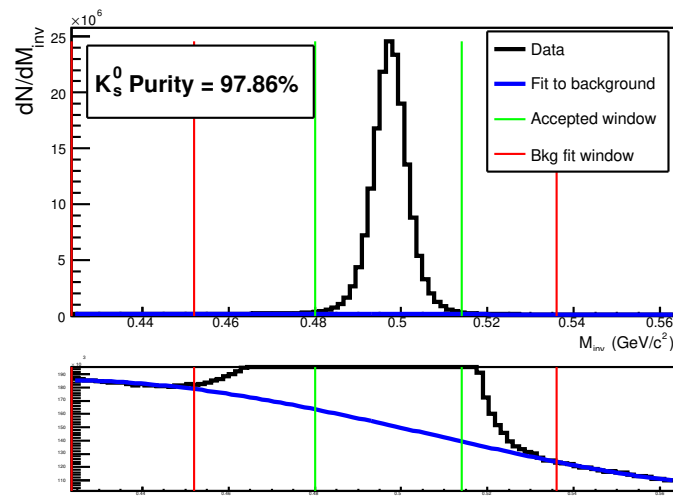


Fig. 2: K_S^0 Purity