0.1 V0 Selection

Λ ($\bar{\Lambda}$) and K^0_S are neutral particles which cannot be directly detected, but must instead be reconstructed through detection of their decay products, or daughters. This process is illustrated in Figure 1. In general, particles which are topologically reconstructed in this fashion are called V0 particles. The class AliFemtoV0TrackCutNSigmaFilter (which is an extension of AliFemtoV0TrackCut) is used to reconstruct the V0s.

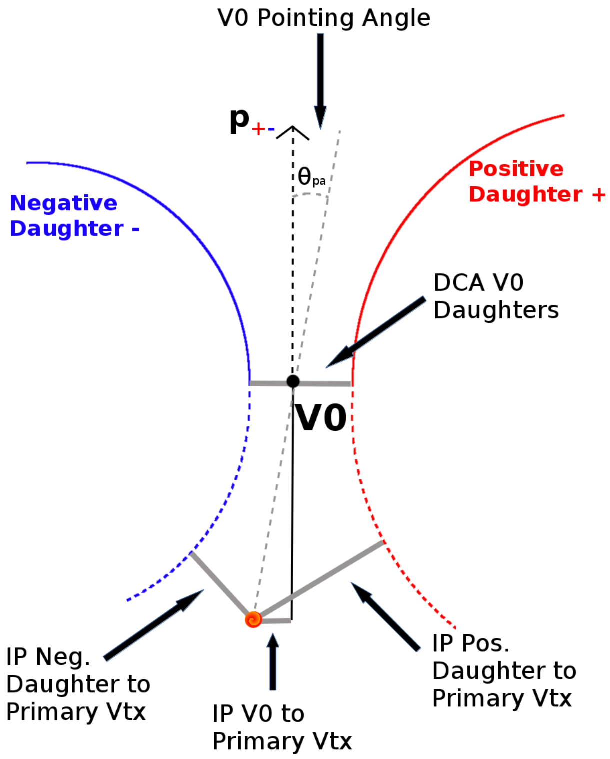

Fig. 1: V0 Reconstruction

0.1.1 Λ Reconstruction

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

1. Cuts Common to Both Daughters
   (a) $|\eta| < 0.8$
   (b) SetTPCnclsDaughters(80)
   (c) SetStatusDaughters(AliESDtrack::kTPCrefic)
   (d) SetMaxDcaV0Daughters(0.4)
2. Pion Specific Daughter Cuts
   (a) $p_T > 0.16$
   (b) DCA to prim vertex > 0.3
3. Proton Specific Daughter Cuts
   (a) $p_T >$
      – 0.5 (p)

   - 0.3 ($\bar{p}$)

   (b) DCA to prim vertex > 0.1

4. Lambda Cuts

   (a) $|\eta| < 0.8$
   (b) $p_T > 0.4$
   (c) $|m_{inv} - m_{PDG}| < 3.8$ MeV
   (d) Cosine of pointing angle > 0.9993
   (e) OnFlyStatus = false
   (f) Decay Length < 60 cm

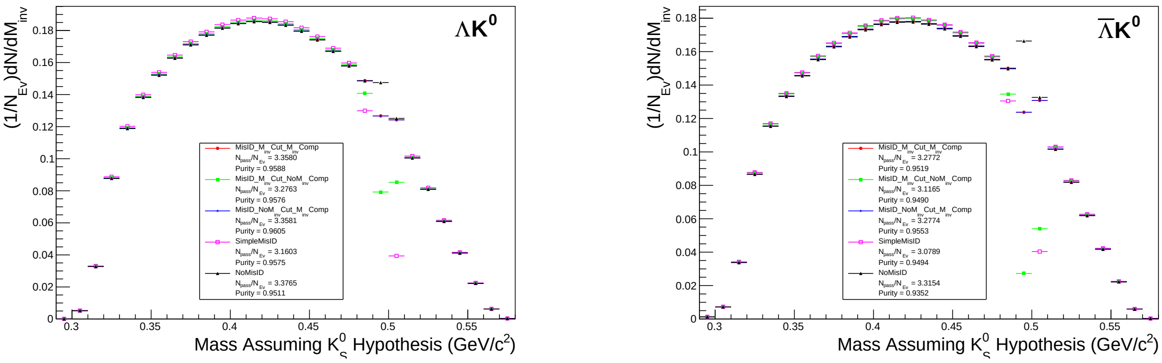

Fig. 2: Mass assuming K^0_S-hypothesis for V0 candidates passing all Λ ($\bar{\Lambda}$) cuts, i.e. assume the daughters are $\pi^+\pi^-$ instead of $p^+\pi^-$ ($\pi^+\bar{p}^-$). The slight peak around m_{inv} = 0.5 GeV/c^2 likely contains misidentified K^0_S particles in our Λ collection. If one simply 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 from this plot while leaving the distribution continuous.

0.1.2 K^0_S Reconstruction

The following cuts were used to select good K^0_S 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^0_S Cuts

   (a) $|\eta| < 0.8$
   (b) $p_T > 0.2$
   (c) $m_{PDG} - 13.677$ MeV $< m_{inv} < m_{PDG} + 2.0323$ MeV

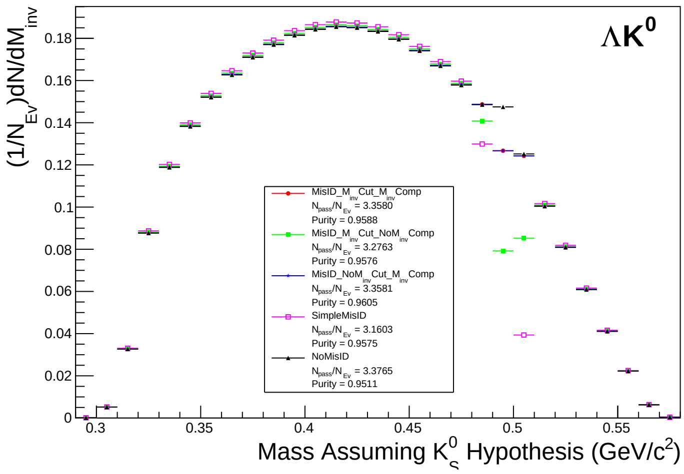

Fig. 3: Mass assuming K^0_S-hypothesis for V0 candidates passing all Λ cuts, i.e. assume the daughters are $\pi^+\pi^-$ instead of $p^+\pi^-$. The slight peak around m_{inv} = 0.5 GeV/c^2 likely contains misidentified K^0_S particles in our Λ collection. If one simply cuts out the entire peak, good Λ particles will be lost. Ideally, the Λ selection and K^0_S misidentification cuts are selected such that the peak is removed from this plot while leaving the distribution continuous.

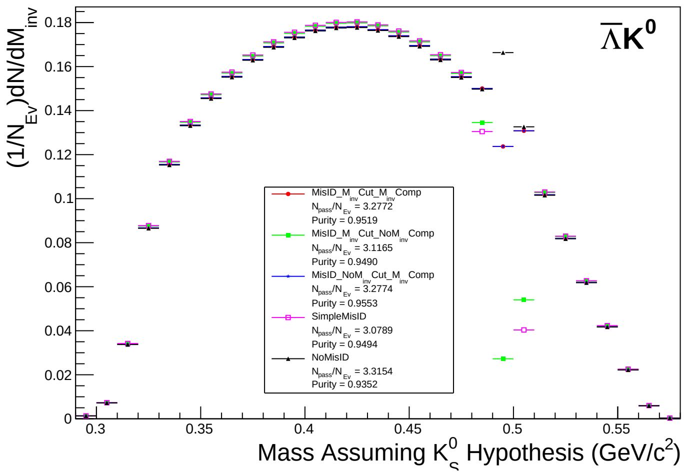

Fig. 4: Mass assuming K^0_S-hypothesis for V0 candidates passing all $\bar{\Lambda}$ cuts, i.e. assume the daughters are $\pi^+\pi^-$ instead of $\pi^+\bar{p}^-$. Similar to Figure 3

(d) Cosine of pointing angle > 0.9993

(e) OnFlyStatus = false

(f) Decay Length $<$ 30 cm

As can be seen in Figures 6 and 7, some misidentified Λ and $\bar{\Lambda}$ particles contaminate our K^0_S sample. Figure 6 shows the mass assuming Λ-hypothesis for V0 candidates passing all K^0_S cuts, i.e. assume the daughters are $p^+\pi^-$ instead of $\pi^+\pi^-$. Figure 7 is similar, but shows the mass assuming $\bar{\Lambda}$ hypothesis for the same K^0_S collection, i.e. assume the daughters are $\pi^+\bar{p}^-$ instead of $\pi^+\pi^-$. The Λ contamination can be seen in Figure 6, and the $\bar{\Lambda}$ contamination in Figure 7, in the peaks around m_{inv} = 1.115 GeV/c^2. Additionally, the $\bar{\Lambda}$ contamination is visible in Figure 6, and the Λ contamination visible in Figure 7, in the region of excess around $1.65 < m_{inv} < 2.1$ GeV/c^2. This is confirmed as the number of misidenti-

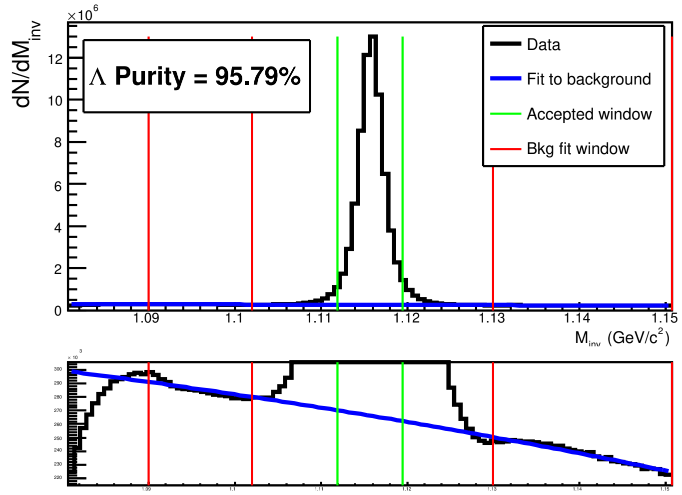

Fig. 5: Λ Purity

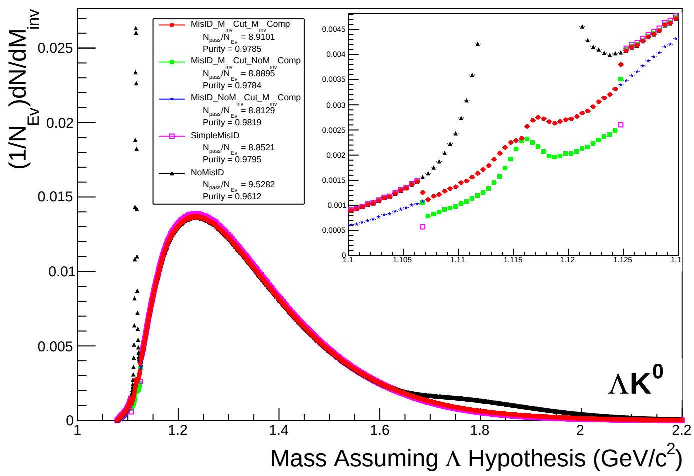

Fig. 6: Mass assuming Λ-hypothesis for V0 candidates passing all K^0_S cuts, i.e. assume the daughters are $p^+\pi^-$ instead of $\pi^+\pi^-$. The peak around $m_{inv} = 1.115$ GeV/c^2 contains misidentified Λ particles in our K^0_S collection. If one simply cuts out the entire peak, some good K^0_S particles will be lost. Ideally, the K^0_S selection and $\Lambda(\bar{\Lambda})$ misidentification cuts can be selected such that the peak is removed from this plot while leaving the distribution continuous. Also note, the excess around $1.65 < m_{inv} < 2.1$ GeV/c^2 shows misidified $\bar{\Lambda}$ particles in our K^0_S collection.

fied Λ particles in the sharp peak of Figure 6 (misidentified $\bar{\Lambda}$ particles in the sharp peak of Figure 7) approximately equals the excess found in the $1.65 < m_{inv} < 2.1$ GeV/c^2 region of Figure 7 (Figure 6).

The peak around $m_{inv} = 1.115$ GeV/c^2 in Figure 6 (Figure 7)contains both misidentified Λ ($\bar{\Lambda}$) particles and good K^0_S. If one simply cuts out the entire peak, some good K^0_S particles will be lost. Ideally, the K^0_S 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^0_S particles, the following misidentification cuts are imposed; a K^0_S 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

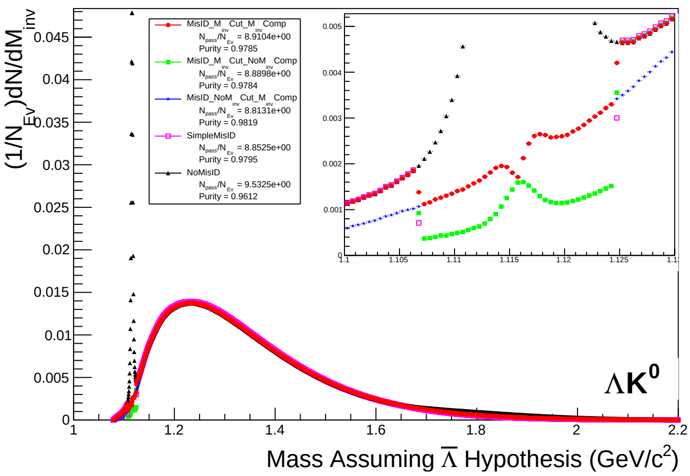

Fig. 7: Mass assuming $\bar{\Lambda}$-hypothesis for V0 candidates passing all K^0_S cuts, i.e. assume the daughters are $\pi^+\bar{p}^-$ instead of $\pi^+\pi^-$. Similar to Figure 6

– Negative daughter passes $\pi^-(\bar{p}^-)$ daughter cut implemented by $\Lambda(\bar{\Lambda})$ reconstruction

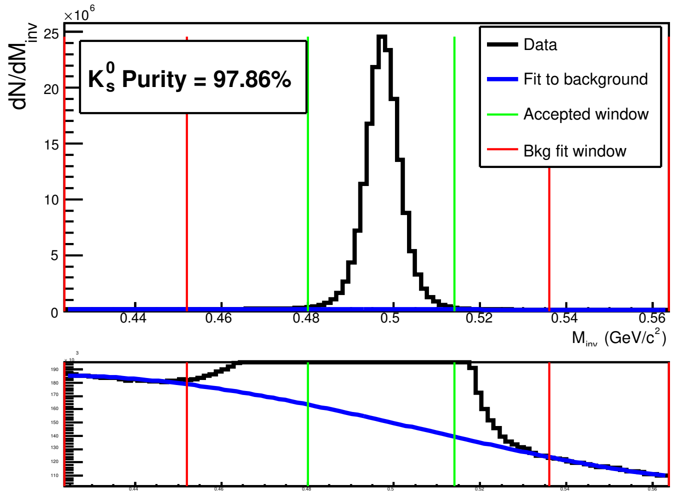

Fig. 8: K^0_S Purity