0.0.1 $\mathrm{K^0_S}$ *Reconstruction*

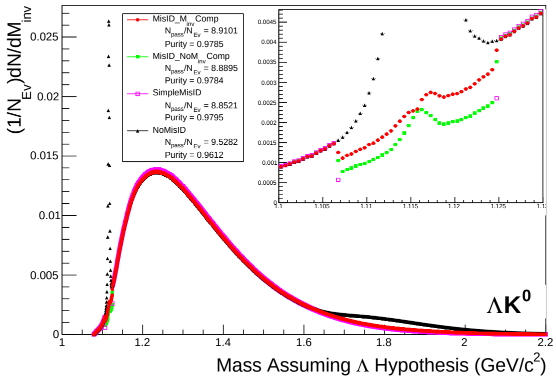
The following cuts, in addition to the misidentification and shared daughter cuts presented in Sec. **??**, were used to select good $\mathrm{K^0_S}$ candidates:

$\mathrm{K^0_S}$ reconstruction		
$\lvert\eta\rvert$		< 0.8
p_{T}		> 0.2 GeV/c
$m_{PDG} - 13.677$ MeV $< m_{\mathrm{inv}} < m_{\mathrm{PDG}} + 2.0323$ MeV		
DCA to prim. vertex		< 0.3 cm
Cosine of pointing angle		> 0.9993
OnFlyStatus		false
Decay Length		< 30 cm
Shared Daughter Cut		true
Misidentification Cut		true
$\pi^{\pm}$ Daughter Cuts		
$\lvert\eta\rvert$		< 0.8
Number of clusters in TPC		> 80
Daughter Status		kTPCrefit
DCA $\pi^+\pi^-$ Daughters		< 0.3 cm
p_{T}		> 0.15 GeV/c
DCA to prim vertex		> 0.3 cm
TPC and TOF Nσ Cuts		
$p < 0.5$ GeV/c		N$\sigma_{\mathrm{TPC}} < 3$
$p > 0.5$ GeV/c	if TOF & TPC available	N$\sigma_{\mathrm{TPC}} < 3$ & N$\sigma_{\mathrm{TOF}} < 3$
	else	N$\sigma_{\mathrm{TOF}} < 3$

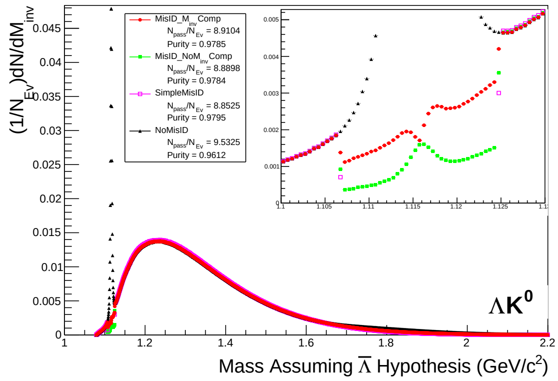
Table 1: $\mathrm{K^0_S}$ reconstruction

As can be seen in Figure 1, some misidentified Λ and $\bar{\Lambda}$ particles contaminate our $\mathrm{K^0_S}$ sample. Figure 1a shows the mass assuming Λ-hypothesis for the $\mathrm{K^0_S}$ 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 $< m_{\mathrm{inv}} <$ 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 $< m_{\mathrm{inv}} <$ 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 $\Lambda(\bar{\Lambda})$ particles and good $\mathrm{K^0_S}$. If one simply cuts out the entire peak, some good $\mathrm{K^0_S}$ particles will be lost. Ideally, the $\mathrm{K^0_S}$ selection and $\Lambda(\bar{\Lambda})$ misidentification cuts can be selected such that the peak is removed from this plot while leaving the underlying distribution continuous. To attempt to remove these Λ and $\bar{\Lambda}$ contaminations without throwing away good $\mathrm{K^0_S}$ particles, the misidentification cuts introduced in Sec. **??** were imposed.



(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$_{\mathrm{inv}}$Comp" (green squares) uses the misidentification cut outlined in the text, but does not utilize the final invariant mass comparison step. "MisID_M$_{\mathrm{inv}}$Comp" (red circles) utilizes the full misidentification methods, and is currently used for this analysis. "N$_{\mathrm{pass}}$/N$_{\mathrm{ev}}$" 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 $1.65 < m_{\mathrm{inv}} < 2.1$ GeV/c^2 shows misidentified $\bar{\Lambda}$ (1a) and Λ (1b) particles in our K^0_S collection.