0.0.1 V0 Purity Estimation

In order to obtain a true and reliable signal, one must ensure good purity of the V0 collection. The purity of the collection is calculated as:

$$Purity = \frac{Signal}{Signal + Background} \tag{1}$$

To access both the signal and background, the invariant mass distribution (m_{inv}) of all V0 candidates must be constructed immediately before the final invariant mass cut, as shown in Fig. 0.1 for Λ, $\bar{\Lambda}$ and K_S^0 candidates in the 0-10% centrality bin. Fig. 0.1a presents the $p\pi^-$ invariant mass distribution showing the Λ peak, Fig. 0.1b presents the $\bar{p}\pi^+$ invariant mass distribution showing the $\bar{\Lambda}$ peak, and Fig. 0.1c presents the $\pi^+\pi^-$ invariant mass distribution showing the K_S^0 peak.

It is vital that this distribution be constructed immediately before the final m_{inv} cut, otherwise it would be impossible to estimate the background. These distributions are used to calculate the collections' purities (defined in Eq. 1). As shown in Figure 0.1, the background is fit (with a polynomial) outside of the peak region of interest to obtain an estimate for the background within the region. Within the m_{inv} cut limits, the background is assumed to be the region below the fit while the signal is that above the fit. The Λ and $\bar{\Lambda}$ purities were found to be $\approx 95\%$, and the K_S^0 purity was found to be $\approx 98\%$.
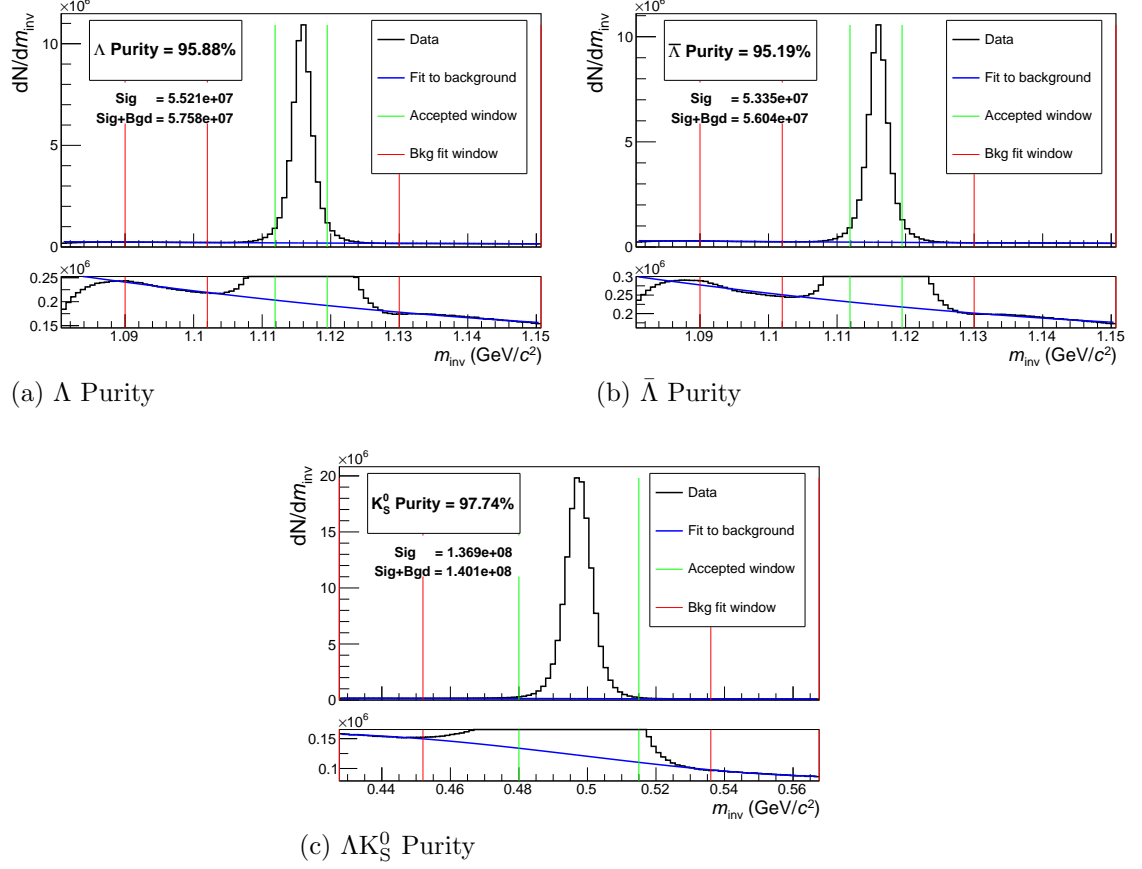
(a) Λ Purity

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

(c) ΛK_S^0 Purity

Figure 0.1: Invariant mass (m_{inv}) distribution for all Λ (a), $\bar{\Lambda}$ (b), and K_S^0 (c) 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 regions 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($\bar{\Lambda}$) $\approx 95\%$, and Purity(K_S^0) $\approx 98\%$.