1 Correlation Functions

This analysis studies the momentum correlations of both Λ-K and Ξ-K pairs using the two-particle correlation function, defined as $C(k^*) = A(k^*)/B(k^*)$, where $A(k^*)$ is the signal distribution, $B(k^*)$ is the reference (or background) distribution, and k^* is the momentum of one of the particles in the pair rest frame. In practice, $A(k^*)$ is constructed by binning in k^* pairs from the same event. Ideally, $B(k^*)$ is similar to $A(k^*)$ in all respects excluding the presence of femtoscopic correlations [**?**]; as such, $B(k^*)$ is used to divide out the phase-space effects, leaving only the femtoscopic effects in the correlation function.

This analysis presents correlation functions for three centrality bins (0-10%, 10-30%, and 30-50%), and is currently pair transverse momentum ($k_T = 0.5|\mathbf{p}_{T,1} + \mathbf{p}_{T,2}|$) integrated (i.e. not binned in k_T). The correlation functions are constructed separately for the two magnetic field configurations, and are combined using a weighted average:

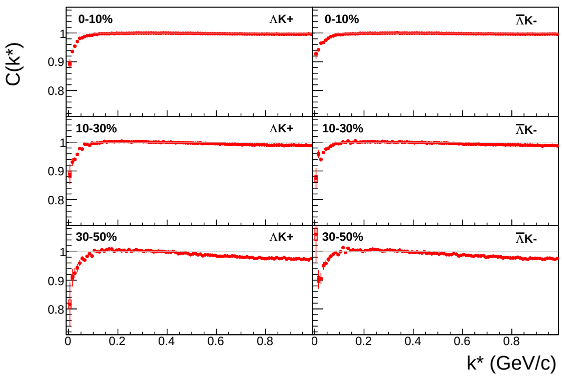
$$C_{combined}(k^*) = \frac{\sum\limits_i w_i C_i(k^*)}{\sum\limits_i w_i} \tag{1}$$

where the sum runs over the correlation functions to be combined, and the weight, w_i, is the number of numerator pairs in $C_i(k^*)$. Here, the sum is over the two field configurations.

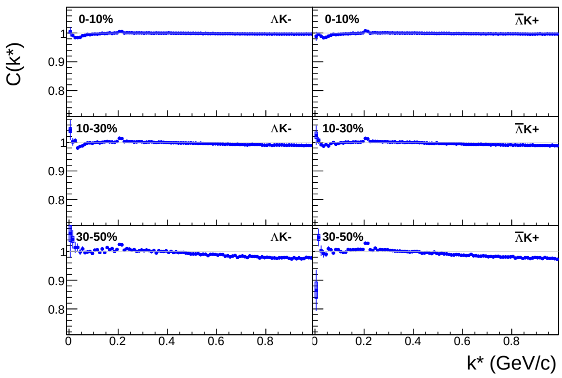
1.1 Typical Correlation Function Construction

Typically, in practice, $B(k^{*})$ is obtained by forming mixed-event pairs, i.e. particles from a given event are paired with particles from $N_{mix}(=5)$ other events, and these pairs are then binned in k^{*}. In forming the background distribution, it is important to mix only similar events; mixing events with different phase-spaces can lead to artificial signals in the correlaton function. Therefore, in this analysis, we mix events with primary vertices within 2 cm and centralities within 5% of each other. Also note, a vertex correction is also applied to each event, which essentially recenters the the primary vertices to z = 0.

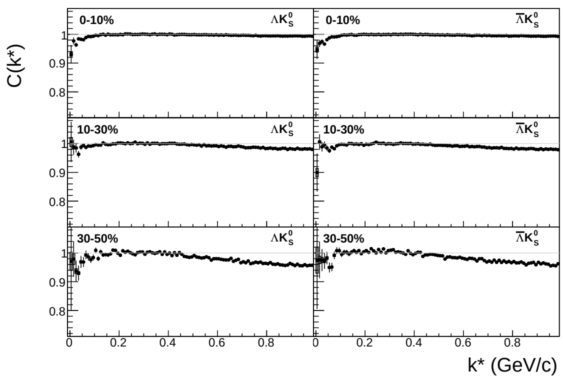
Figures 1, 2, and 3 show the correlation functions for all centalities studied for $\Lambda K^0_S(\bar{\Lambda}K^0_S)$, $\Lambda K^+(\bar{\Lambda}K^-)$, and $\Lambda K^-(\bar{\Lambda}K^+)$, respectively. All were normalized in the range $0.32 < k^{*} < 0.4$ GeV/c.



(a) ΛK^+ (left) and $\bar{\Lambda}K^-$ (right) correlations for 0-10% (top), 10-30%(middle), and 30-50%(bottom) centralities.



(b) ΛK^- (left) and $\bar{\Lambda}K^+$ (right) correlations for 0-10% (top), 10-30%(middle), and 30-50%(bottom) centralities. The peak at k* $\approx$ 0.2 GeV/c is due to the Ω^- resonance.



(c) ΛK^0_S (left) and $\bar{\Lambda}K^0_S$ (right) correlations for 0-10% (top), 10-30%(middle), and 30-50%(bottom) centralities.

Fig. 1: ΛK and $\bar{\Lambda}\bar{K}$ correlation functions for 0-10%, 10-30%, and 30-50% centralities. The lines represent the statistical errors, while the boxes represent the systematic errors.

1.2 Stavinsky Correlation Function Construction

Stavinsky is tight.

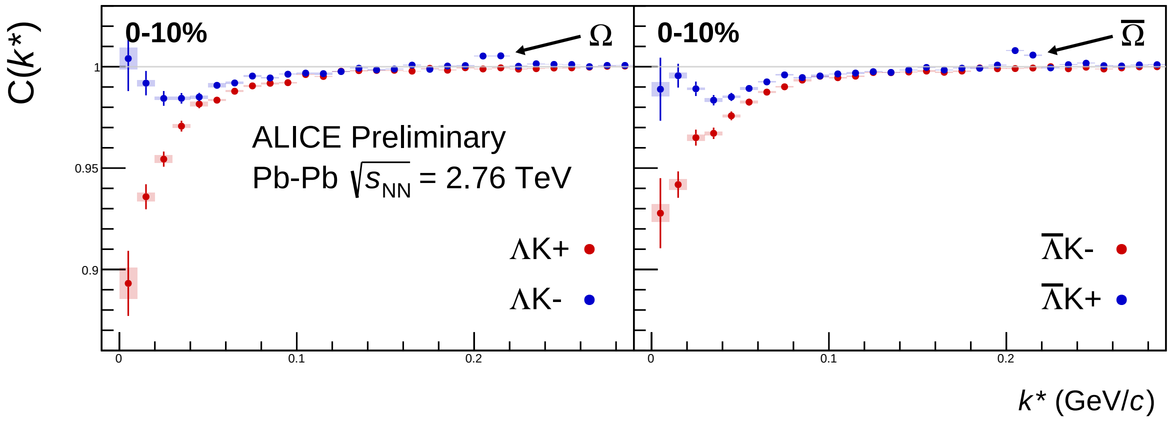


Fig. 2: Correlation Functions: ΛK^+ vs ΛK^- ($\bar{\Lambda}K^+$ vs $\bar{\Lambda}K^-$) for 0-10% centrality. The peak in ΛK^-($\bar{\Lambda}K^+$) at k* $\approx$ 0.2 GeV/c is due to the Ω^- resonance. The lines represent the statistical errors. (NOTE: This figure is slightly dated, and a new one will be generated which includes both statistical and systematic uncertainties)