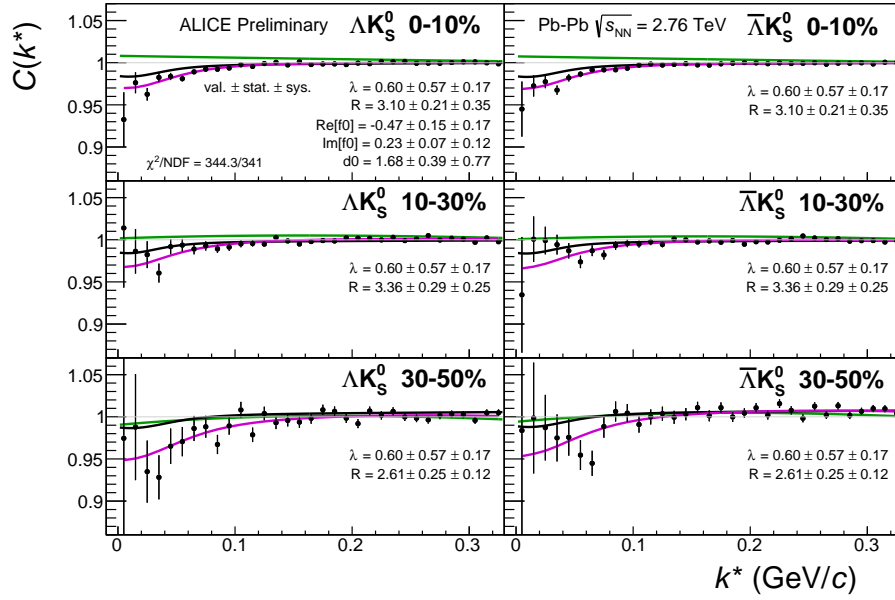


0.0.1 Results: ΛK_S^0 and ΛK^\pm : 10 Residual Correlations Included in Fit

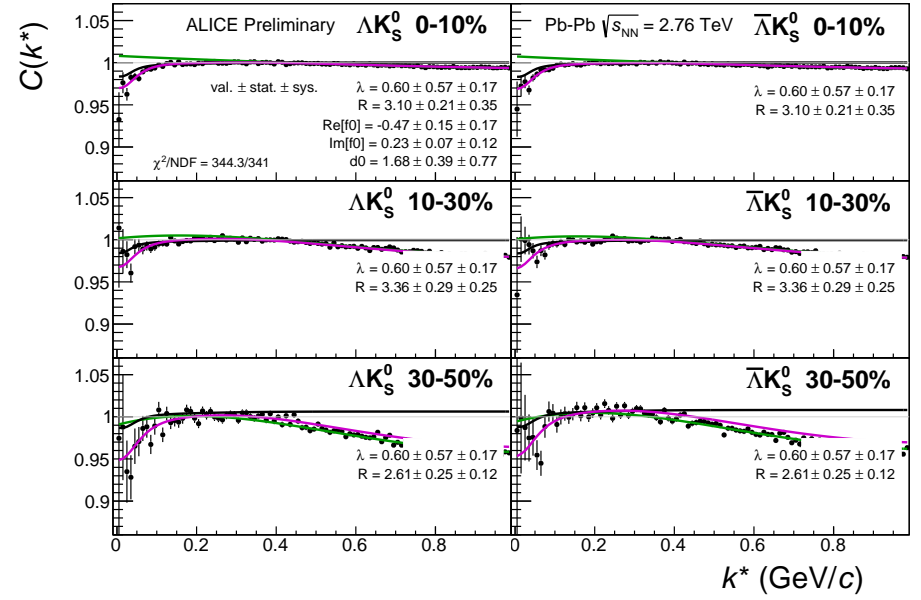
Figures 1, 2, and 3 (Section ??) show experimental data with fits for all studied centralities for ΛK_S^0 with $\bar{\Lambda} K_S^0$, ΛK^+ with $\bar{\Lambda} K^-$, and ΛK^- with $\bar{\Lambda} K^+$, respectively. The parameter sets extracted from the fits can be found in Tables 1 and 2. All correlation functions were normalized in the range $0.32 < k^* < 0.40$ GeV/c, and fit in the range $0.0 < k^* < 0.30$ GeV/c. For the ΛK^- and $\bar{\Lambda} K^+$ analyses, the region $0.19 < k^* < 0.23$ GeV/c was excluded from the fit to exclude the bump caused by the Ω^- resonance. The non-flat background was fit with a linear form from $0.6 < k^* < 0.9$ GeV/c. The theoretical fit function was then multiplied by this background during the fitting process.

In the figures (1, 2, and 3), the black solid line represents the “raw” fit, i.e. not corrected for momentum resolution effects nor non-flat background. The green line shows the fit to the non-flat background. The purple points show the fit after momentum resolution and non-flat background corrections have been applied. The initial values of the parameters is listed, as well as the final fit values with uncertainties.

For the ΛK_S^0 fits without residuals, λ was restricted to $[0.4, 0.6]$.

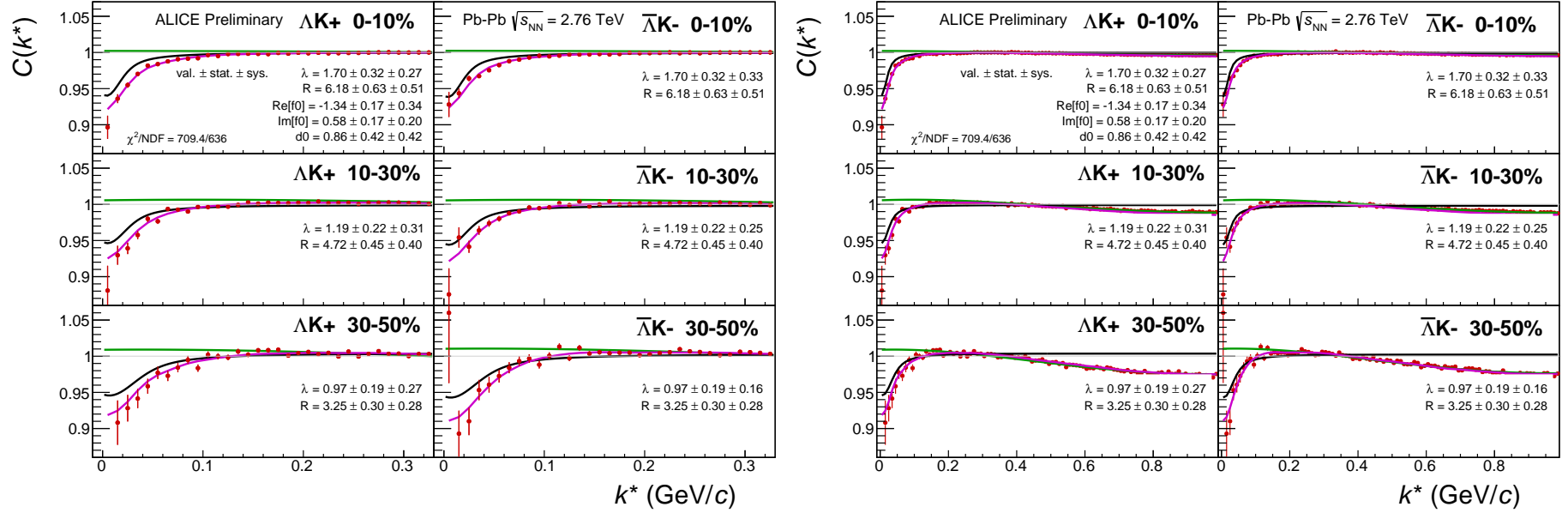


(a) Signal region view ($k^* \lesssim 0.3$ GeV/c)



(b) Wide view ($k^* \lesssim 1.0$ GeV/c)

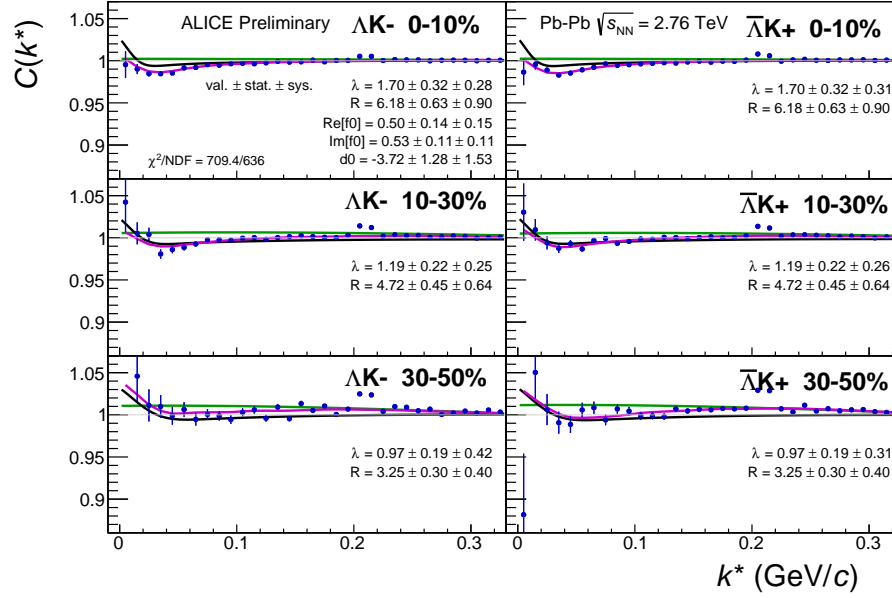
Fig. 1: Fits, with 10 residual correlations included, to the ΛK_S^0 (left) and $\bar{\Lambda} K_S^0$ (right) data for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom). The lines represent the statistical errors, while the boxes represent the systematic errors. Each has unique λ and normalization parameters. The radii are shared amongst like centralities; the scattering parameters ($\text{Re}[f_0]$, $\text{Im}[f_0]$, d_0) are shared amongst all. The black solid line represents the “raw” fit, i.e. not corrected for momentum resolution effects nor non-flat background. The green line shows the fit to the non-flat background. The purple points show the fit after momentum resolution and non-flat background corrections have been applied. The initial values of the parameters is listed, as well as the final fit values with uncertainties. Here, R was restricted to $[2., 10.]$ and Λ was restricted to $[0.1, 0.8]$.



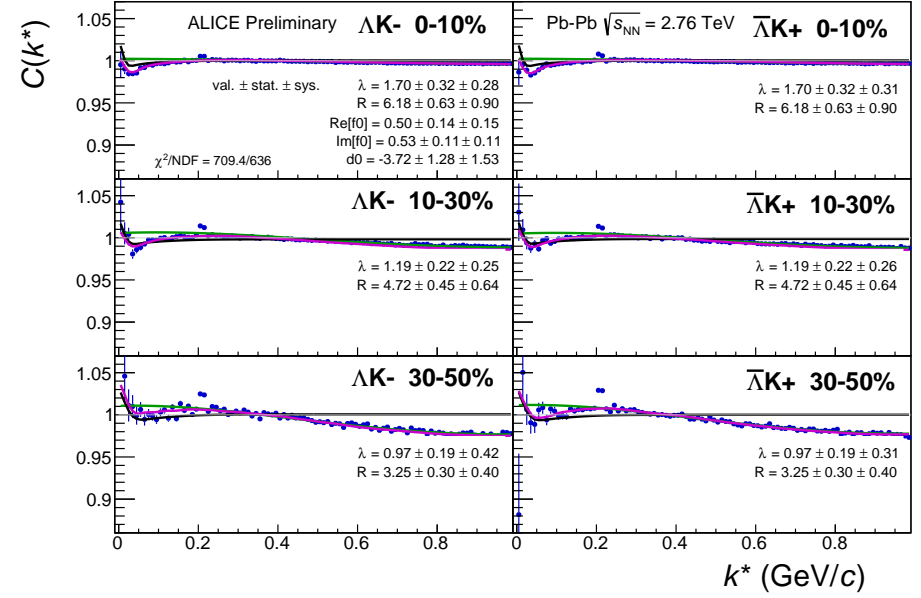
(a) Signal region view ($k^* \lesssim 0.3$ GeV/c)

(b) Wide view ($k^* \lesssim 1.0$ GeV/c)

Fig. 2: Fits, with 10 residual correlations included, to the ΛK^+ (left) and $\bar{\Lambda} K^-$ (right) data for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom). The lines represent the statistical errors, while the boxes represent the systematic errors. Each has unique λ and normalization parameters. The radii are shared amongst like centralities; the scattering parameters ($\text{Re}[f_0]$, $\text{Im}[f_0]$, d_0) are shared amongst all. The black solid line represents the “raw” fit, i.e. not corrected for momentum resolution effects nor non-flat background. The green line shows the fit to the non-flat background. The purple points show the fit after momentum resolution and non-flat background corrections have been applied. The initial values of the parameters is listed, as well as the final fit values with uncertainties.



(a) Signal region view ($k^* \lesssim 0.3$ GeV/c)



(b) Wide view ($k^* \lesssim 1.0$ GeV/c)

Fig. 3: Fits, with 10 residual correlations included, to the ΔK^- (left) with $\bar{\Delta K}^+$ (right) data for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom). The lines represent the statistical errors, while the boxes represent the systematic errors. Each has unique λ and normalization parameters. The radii are shared amongst like centralities; the scattering parameters ($\Re f_0$, $\Im f_0$, d_0) are shared amongst all. The black solid line represents the “raw” fit, i.e. not corrected for momentum resolution effects nor non-flat background. The green line shows the fit to the non-flat background. The purple points show the fit after momentum resolution and non-flat background corrections have been applied. The initial values of the parameters is listed, as well as the final fit values with uncertainties.

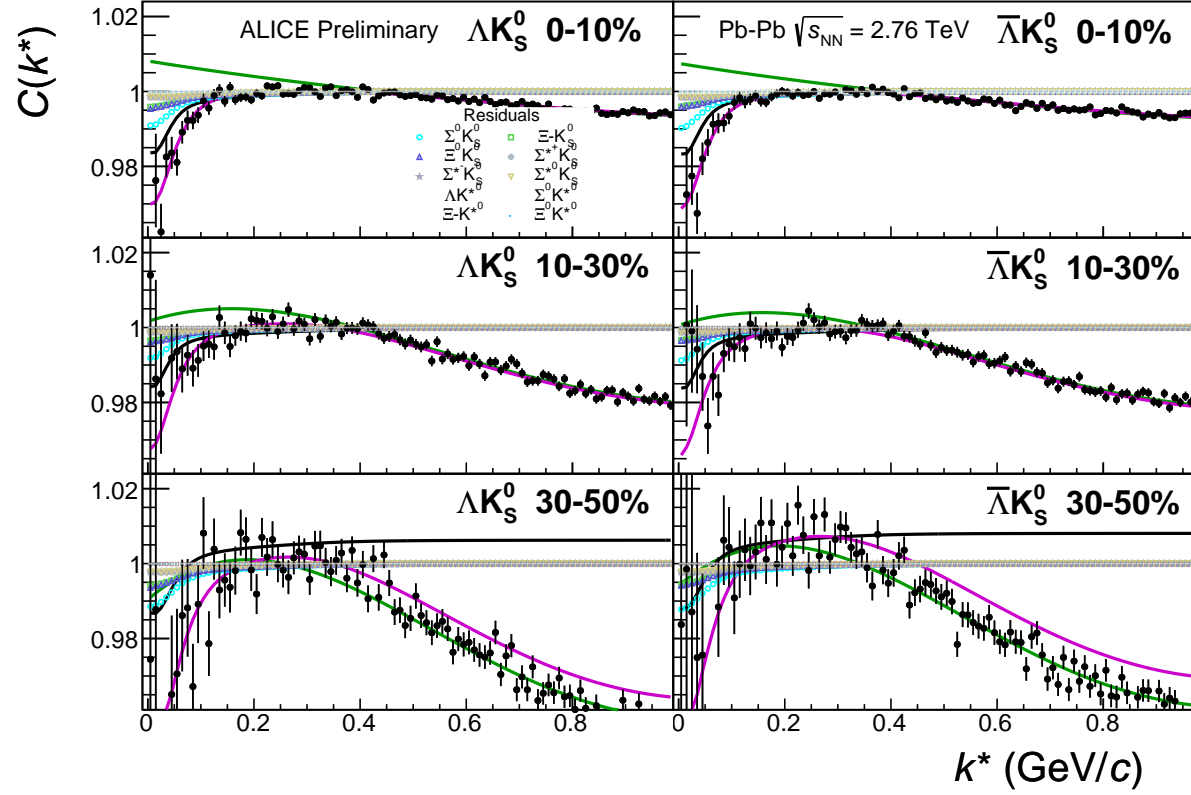
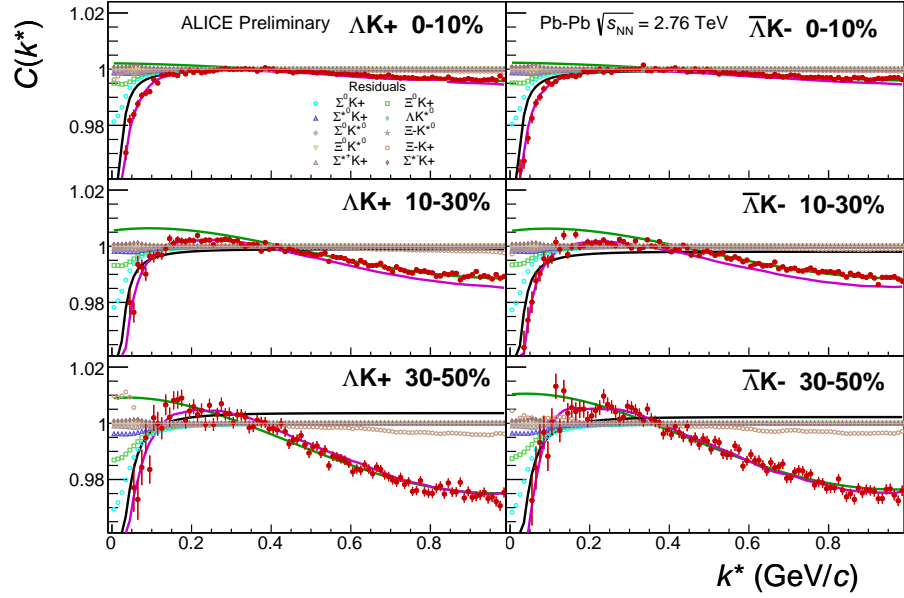
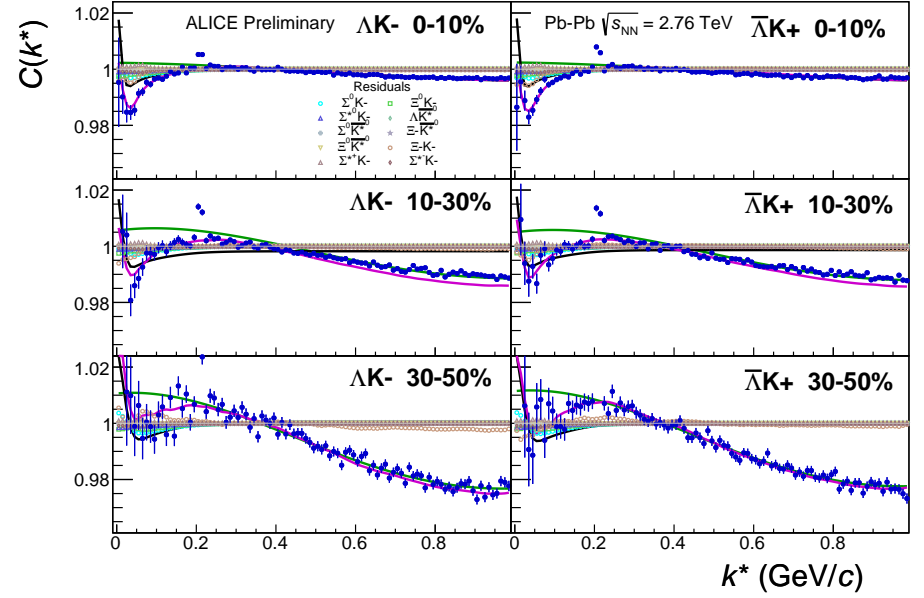


Fig. 4: Fits, with 10 residual correlations included and shown, to the ΛK_S^0 (left) and $\bar{\Lambda} K_S^0$ (right) data for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom). The ten parent pairs used for the residual correction to the ΛK_S^0 ($\bar{\Lambda} K_S^0$) fit are $\Sigma^0 K_S^0$, $\Xi^0 K_S^0$, $\Xi^- K_S^0$, $\Sigma^{*+} K_S^0$, ΛK^{*0} , $\Sigma^0 K^{*0}$, $\Xi^0 K^{*0}$, and $\Xi^- K^{*0}$ ($\bar{\Sigma}^0 K_S^0$, $\bar{\Xi}^0 K_S^0$, $\bar{\Xi}^+ K_S^0$, $\bar{\Sigma}^{*+} K_S^0$, $\bar{\Lambda} \bar{K}^{*0}$, $\bar{\Sigma}^0 \bar{K}^{*0}$, $\bar{\Xi}^0 \bar{K}^{*0}$, and $\bar{\Xi}^+ \bar{K}^{*0}$).



(a) ΛK^+ ($\bar{\Lambda} K^-$) fits with residual contributions shown for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom)



(b) ΛK^- ($\bar{\Lambda} K^+$) fits with residual contributions shown for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom)

Fig. 5: Fits, with 10 residual correlations included and shown, to the ΛK^+ & $\bar{\Lambda} K^-$ (left) and ΛK^- & $\bar{\Lambda} K^+$ (right) data for the centralities 0-10% (top), 10-30% (middle), and 30-50% (bottom). The ten parent pairs used for the residual correction to the ΛK^+ ($\bar{\Lambda} K^-$) fit are $\Sigma^0 K^+$, $\Xi^0 K^+$, $\Xi^- K^+$, $\Sigma^{*(+,-,0)} K^+$, ΛK^0 , $\Sigma^0 K^0$, $\Xi^0 K^0$, $\Xi^- K^0$, $\Sigma^{*0} K^+$, and $\Sigma^{*0} K^+$ ($\bar{\Sigma}^0 K^-$, $\bar{\Xi}^0 K^-$, $\bar{\Xi}^+ K^-$, $\bar{\Sigma}^{*(+,-,0)} K^-$, $\bar{\Lambda} K^0$, $\bar{\Sigma}^0 K^0$, $\bar{\Xi}^0 K^0$, and $\bar{\Xi}^+ K^0$).

Fit Results $\Lambda(\bar{\Lambda})K_S^0$						
Pair Type	Centrality	Fit Parameters				
		λ	R	$\Re f_0$	$\Im f_0$	d_0
ΛK_S^0	0-10%	$0.60 \pm 0.63 \text{ (stat.)} \pm 0.17 \text{ (sys.)}$	$2.94 \pm 0.45 \text{ (stat.)} \pm 0.35 \text{ (sys.)}$	$-0.40 \pm 0.12 \text{ (stat.)} \pm 0.17 \text{ (sys.)}$	$0.17 \pm 0.08 \text{ (stat.)} \pm 0.12 \text{ (sys.)}$	$1.94 \pm 0.47 \text{ (stat.)} \pm 0.77 \text{ (sys.)}$
	10-30%		$2.39 \pm 0.38 \text{ (stat.)} \pm 0.25 \text{ (sys.)}$			
	30-50%		$1.81 \pm 0.29 \text{ (stat.)} \pm 0.12 \text{ (sys.)}$			
$\bar{\Lambda} K_S^0$	0-10%	$0.60 \pm 0.63 \text{ (stat.)} \pm 0.17 \text{ (sys.)}$	$2.94 \pm 0.45 \text{ (stat.)} \pm 0.35 \text{ (sys.)}$	$-0.40 \pm 0.12 \text{ (stat.)} \pm 0.17 \text{ (sys.)}$	$0.17 \pm 0.08 \text{ (stat.)} \pm 0.12 \text{ (sys.)}$	$1.94 \pm 0.47 \text{ (stat.)} \pm 0.77 \text{ (sys.)}$
	10-30%		$2.39 \pm 0.38 \text{ (stat.)} \pm 0.25 \text{ (sys.)}$			
	30-50%		$1.81 \pm 0.29 \text{ (stat.)} \pm 0.12 \text{ (sys.)}$			

Table 1: Fit Results $\Lambda(\bar{\Lambda})K_S^0$, with 10 residual correlations included. Each pair is fit simultaneously with its conjugate (ie. ΛK_S^0 with $\bar{\Lambda} K_S^0$) across all centralities (0-10%, 10-30%, 30-50%), for a total of 6 simultaneous analyses in the fit. Each analysis has a unique λ and normalization parameter. The radii are shared between analyses of like centrality, as these should have similar source sizes. The scattering parameters ($\Re f_0$, $\Im f_0$, d_0) are shared amongst all. The fit is done on the data with only statistical error bars. The errors marked as “stat.” are those returned by MINUIT. The errors marked as “sys.” are those which result from my systematic analysis (as outlined in Section ??).

Fit Results $\Lambda(\bar{\Lambda})K^\pm$						
Pair Type	Centrality	Fit Parameters				
		λ	R	$\Re f_0$	$\Im f_0$	d_0
ΛK^+	0-10%	1.51 ± 0.56 (stat.) ± 0.27 (sys.)	5.92 ± 1.08 (stat.) ± 0.51 (sys.)	-1.38 ± 0.32 (stat.) ± 0.34 (sys.)	0.61 ± 0.34 (stat.) ± 0.20 (sys.)	0.97 ± 0.66 (stat.) ± 0.42 (sys.)
	10-30%	1.47 ± 0.55 (stat.) ± 0.31 (sys.)	4.98 ± 0.86 (stat.) ± 0.40 (sys.)			
	30-50%	1.10 ± 0.30 (stat.) ± 0.27 (sys.)	3.38 ± 0.45 (stat.) ± 0.28 (sys.)			
$\bar{\Lambda} K^-$	0-10%	1.52 ± 0.58 (stat.) ± 0.33 (sys.)	5.92 ± 1.08 (stat.) ± 0.51 (sys.)	-1.38 ± 0.32 (stat.) ± 0.34 (sys.)	0.61 ± 0.34 (stat.) ± 0.20 (sys.)	0.97 ± 0.66 (stat.) ± 0.42 (sys.)
	10-30%	1.28 ± 0.47 (stat.) ± 0.25 (sys.)	4.98 ± 0.86 (stat.) ± 0.40 (sys.)			
	30-50%	1.06 ± 0.28 (stat.) ± 0.16 (sys.)	3.38 ± 0.45 (stat.) ± 0.28 (sys.)			
ΛK^-	0-10%	1.72 ± 0.61 (stat.) ± 0.28 (sys.)	6.54 ± 1.22 (stat.) ± 0.90 (sys.)	0.53 ± 0.20 (stat.) ± 0.15 (sys.)	0.57 ± 0.17 (stat.) ± 0.11 (sys.)	-4.13 ± 1.74 (stat.) ± 1.53 (sys.)
	10-30%	1.24 ± 0.43 (stat.) ± 0.25 (sys.)	4.90 ± 0.94 (stat.) ± 0.64 (sys.)			
	30-50%	1.34 ± 0.75 (stat.) ± 0.42 (sys.)	3.10 ± 0.67 (stat.) ± 0.40 (sys.)			
$\bar{\Lambda} K^+$	0-10%	1.72 ± 0.58 (stat.) ± 0.31 (sys.)	6.54 ± 1.22 (stat.) ± 0.90 (sys.)	0.53 ± 0.20 (stat.) ± 0.15 (sys.)	0.57 ± 0.17 (stat.) ± 0.11 (sys.)	-4.13 ± 1.74 (stat.) ± 1.53 (sys.)
	10-30%	1.33 ± 0.46 (stat.) ± 0.26 (sys.)	4.90 ± 0.94 (stat.) ± 0.64 (sys.)			
	30-50%	0.84 ± 0.31 (stat.) ± 0.31 (sys.)	3.10 ± 0.67 (stat.) ± 0.40 (sys.)			

Table 2: Fit Results $\Lambda(\bar{\Lambda})K^\pm$, with 10 residual correlations included.. Each pair is fit simultaneously with its conjugate (ie. ΛK^+ with $\bar{\Lambda} K^-$ and ΛK^- with $\bar{\Lambda} K^+$) across all centralities (0-10%, 10-30%, 30-50%), for a total of 6 simultaneous analyses in the fit. Each analysis has a unique λ and normalization parameter. The radii are shared between analyses of like centrality, as these should have similar source sizes. The scattering parameters ($\Re f_0$, $\Im f_0$, d_0) are shared amongst all. The fit is done on the data with only statistical error bars. The errors marked as “stat.” are those returned by MINUIT. The errors marked as “sys.” are those which result from my systematic analysis (as outlined in Section ??).

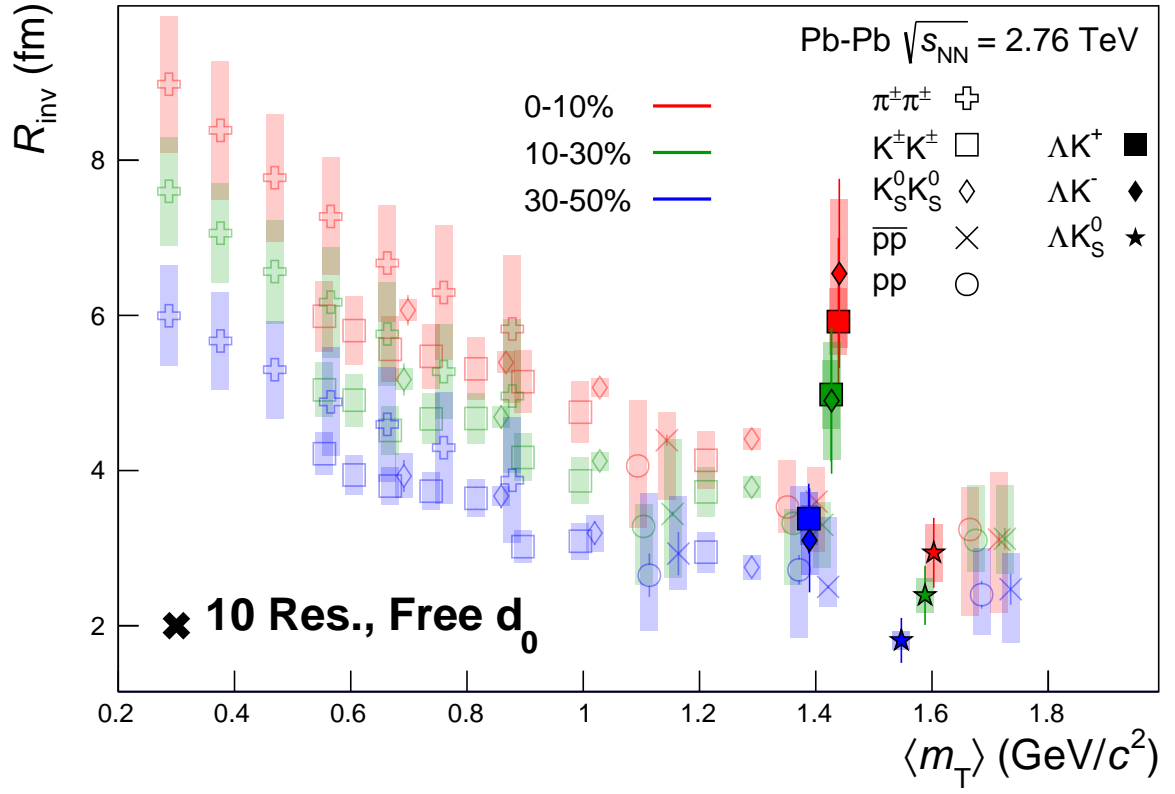


Fig. 6: 10 residual correlations in ΛK fits. Extracted fit R_{inv} parameters as a function of pair transverse mass (m_T) for various pair systems over several centralities. The ALICE published data [?] is shown with transparent, open symbols. The new ΛK results are shown with opaque, filled symbols. In the left, the ΛK^+ (with its conjugate pair) results are shown separately from the ΛK^- (with its conjugate pair) results. In the right, all ΛK^\pm results are averaged.