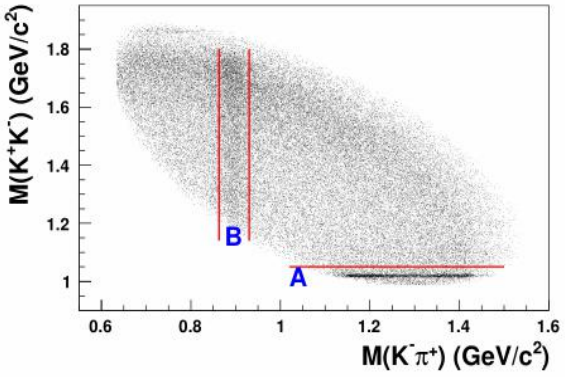
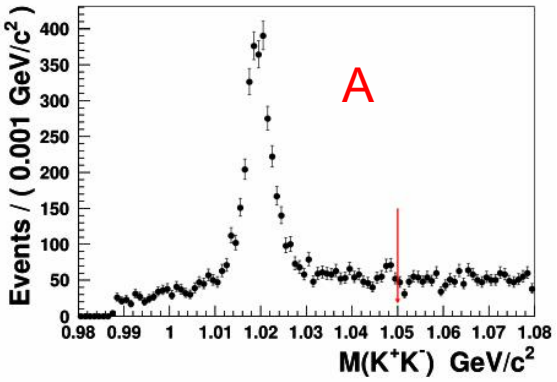
Discussion on D_{sJ} analysis

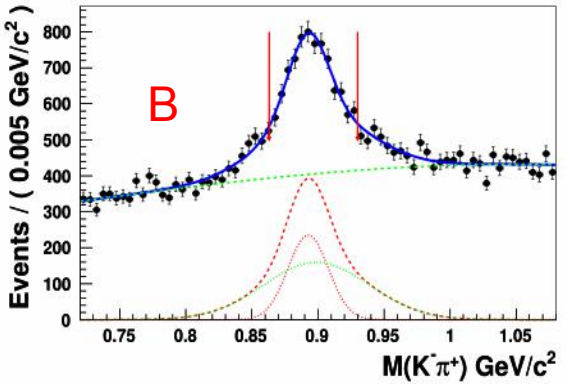
2017 3 1

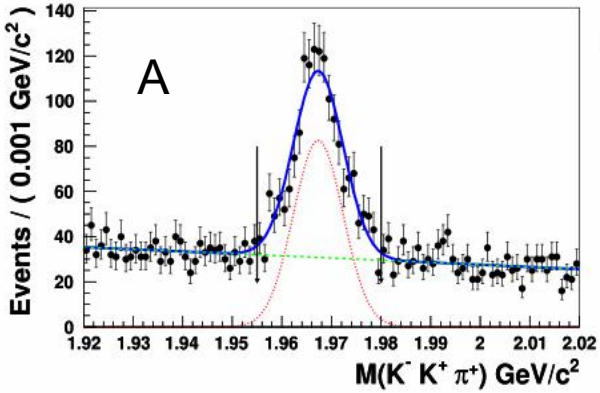
Big picture of the analysis strategies

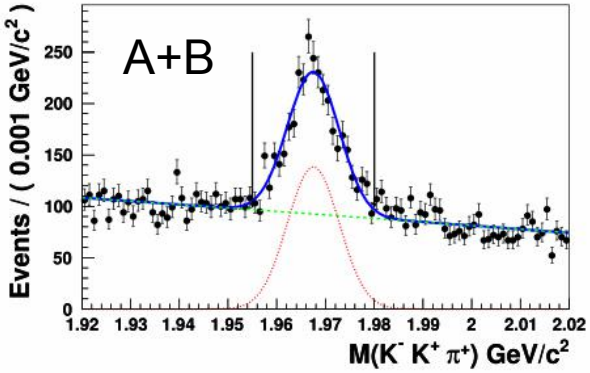
D_s selections





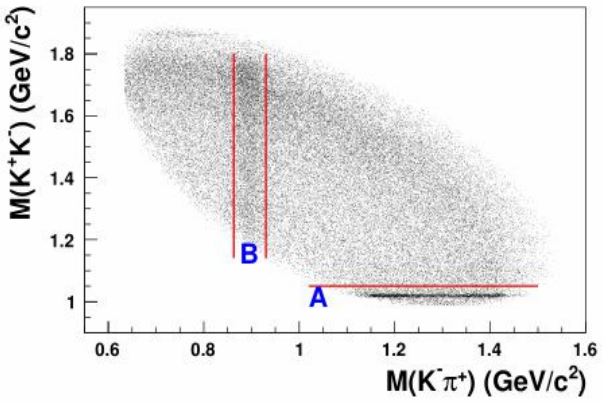


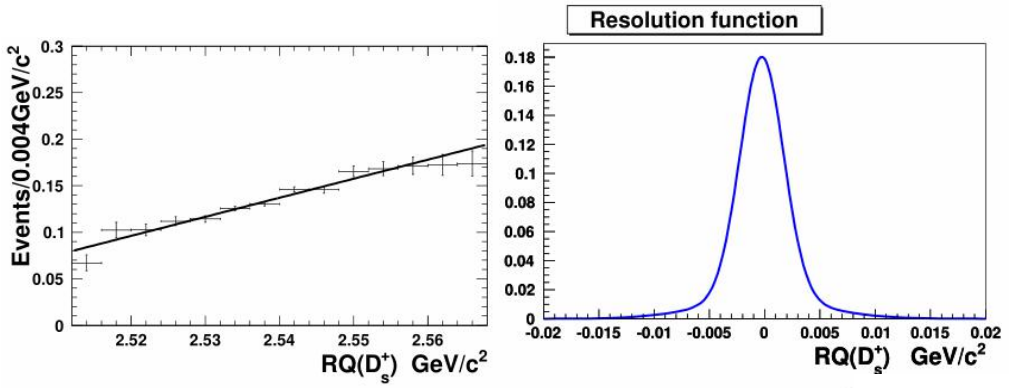


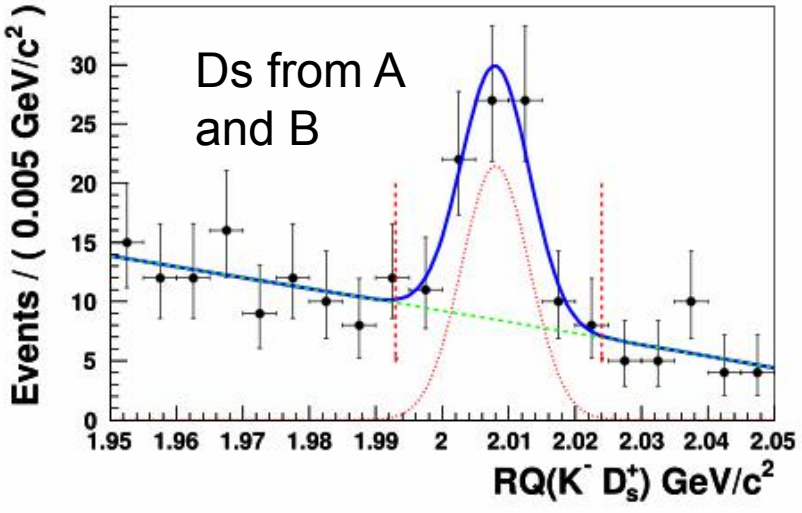


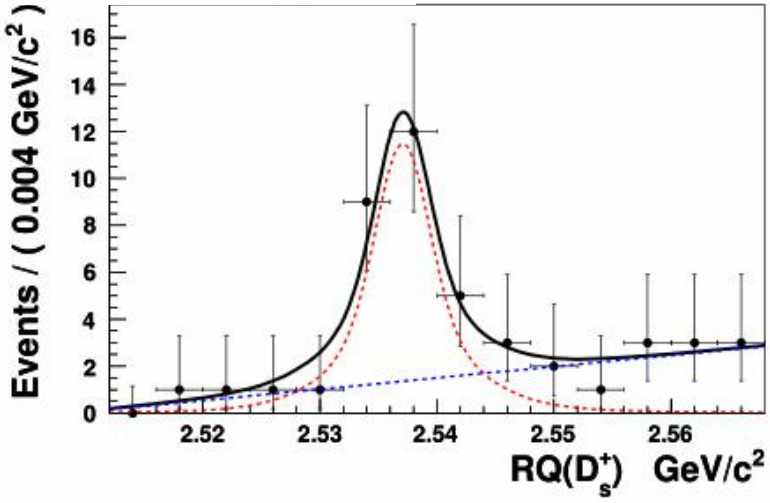
$$RQ(K^- D_s^+) = RM(K^- D_s^+) + M(D_s^+) - m(D_s^+);$$
$$RQ(D_s^+) = RM(D_s^+) + M(D_s^+) - m(D_s^+).$$

$D_{s1}(2536)$





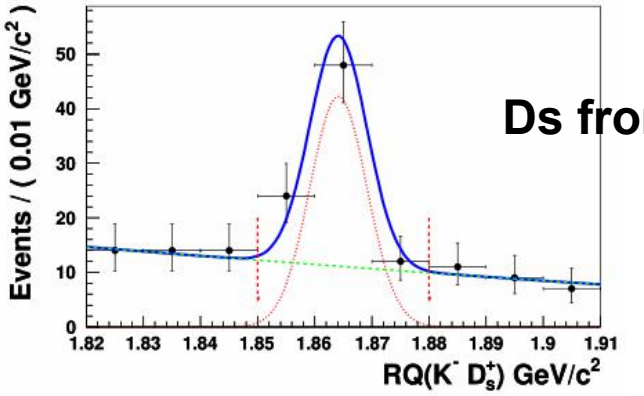




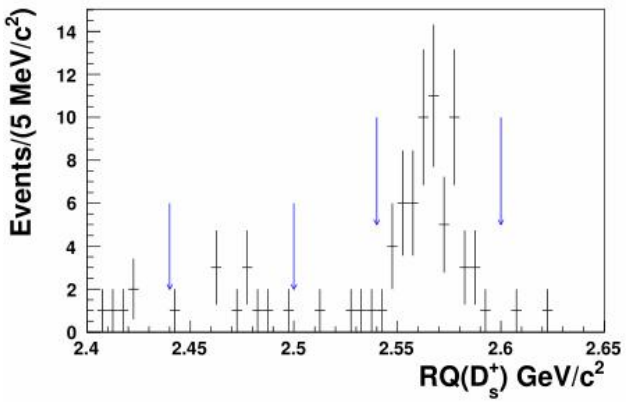
$$m(D_{s1}(2536)^-) = 2537.7 \pm 0.5\,\mathrm{MeV/c^2}$$

$$\Gamma(D_{s1}(2536)^-) = 1.7 \pm 1.2\mathrm{MeV}$$

$D_{s2}(2573)$ spin-parity



Ds from A



	spin-parity state	
	1^-	2^+
$d\sigma/d\Omega$	$(1+\cos^2\theta+\sin^2\theta\cos 2\phi')\frac{1}{2}\sin^2\theta'$	$(1+\cos^2\theta-\sin^2\theta\cos 2\phi')\frac{3}{8}\sin^2 2\theta'$
$d\sigma/d\cos\theta$	$1+\cos^2\theta$	$1+\cos^2\theta$
$d\sigma/d\cos\theta'$	$1-\cos^2\theta'$	$\cos^2\theta'(1-\cos^2\theta')$
$d\sigma/d\phi'$	$1+(1/2)\cos 2\phi'$	$1-(1/2)\cos 2\phi'$

$D_{s2}(2573)$ spin-parity

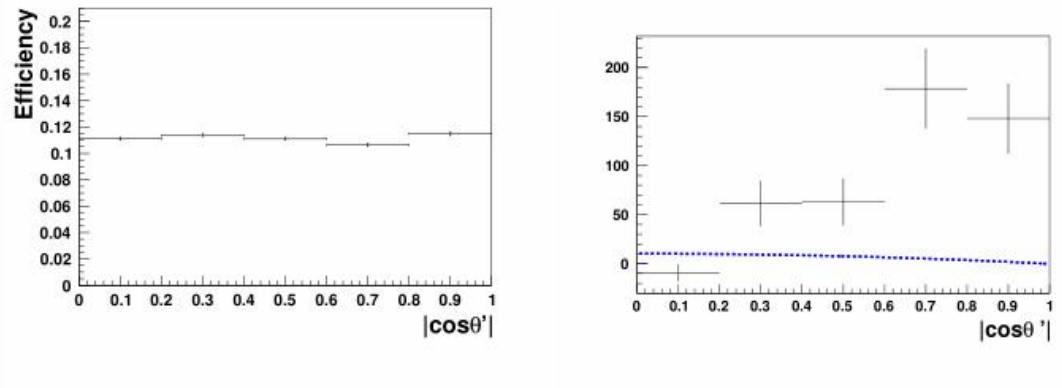


Figure 3.14 Efficiency distribution of $\cos\theta'$ of $J^P = 1^-$ assumption, and fit to the efficiency corrected angular distribution.

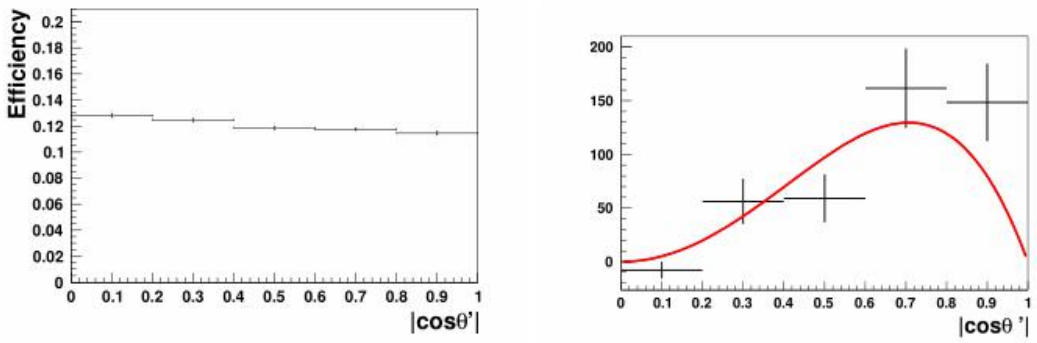
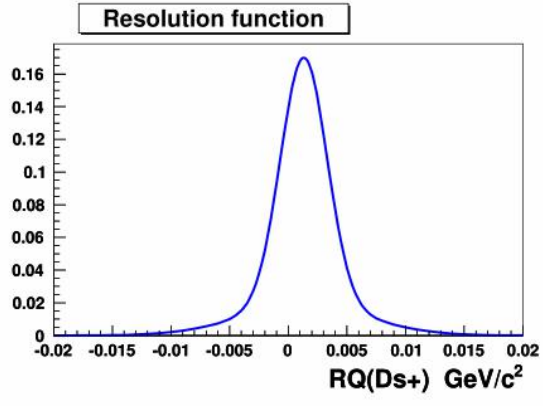
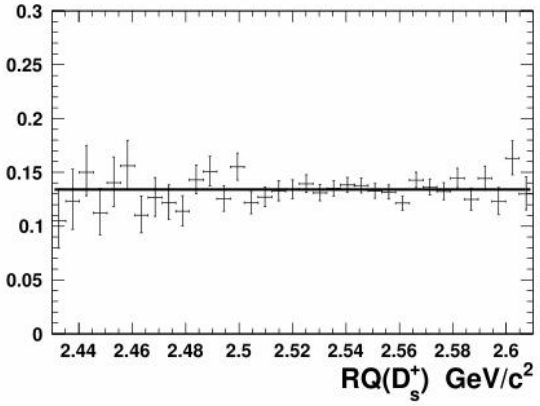
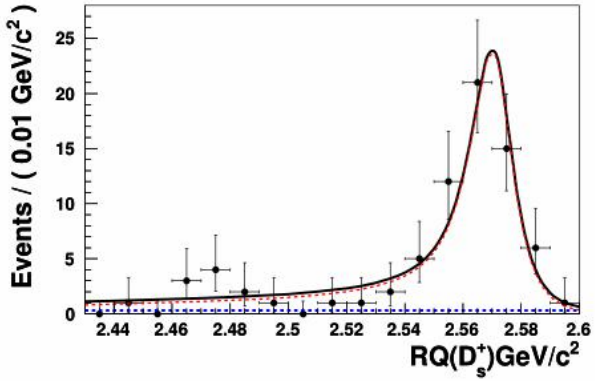


Figure 3.15 Efficiency distribution of $\cos\theta'$ of $J^P = 2^+$ assumption, and fit to the efficiency corrected angular distribution.

$D_{s2}(2573)$

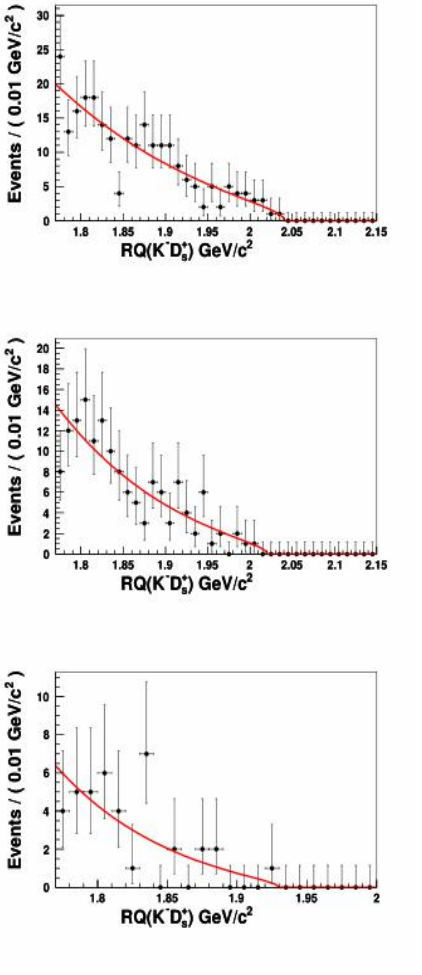

Resolution function
RQ(Ds+) GeV/c²

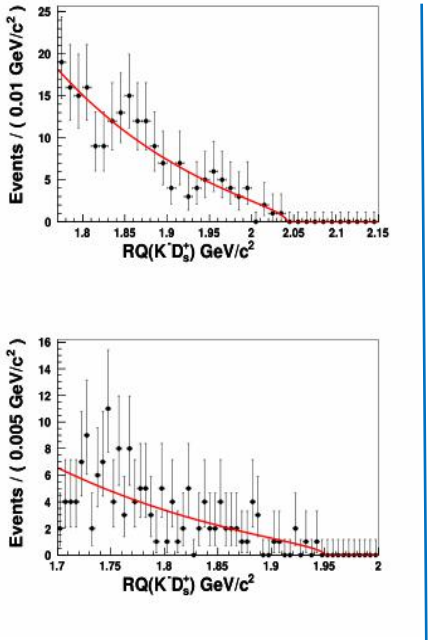

RQ(D_s^+) GeV/c²


Events / (0.01 GeV/c²)
RQ(D_s^+)GeV/c²

Cross sections

3 body processes ee\to Ds K D(*)0





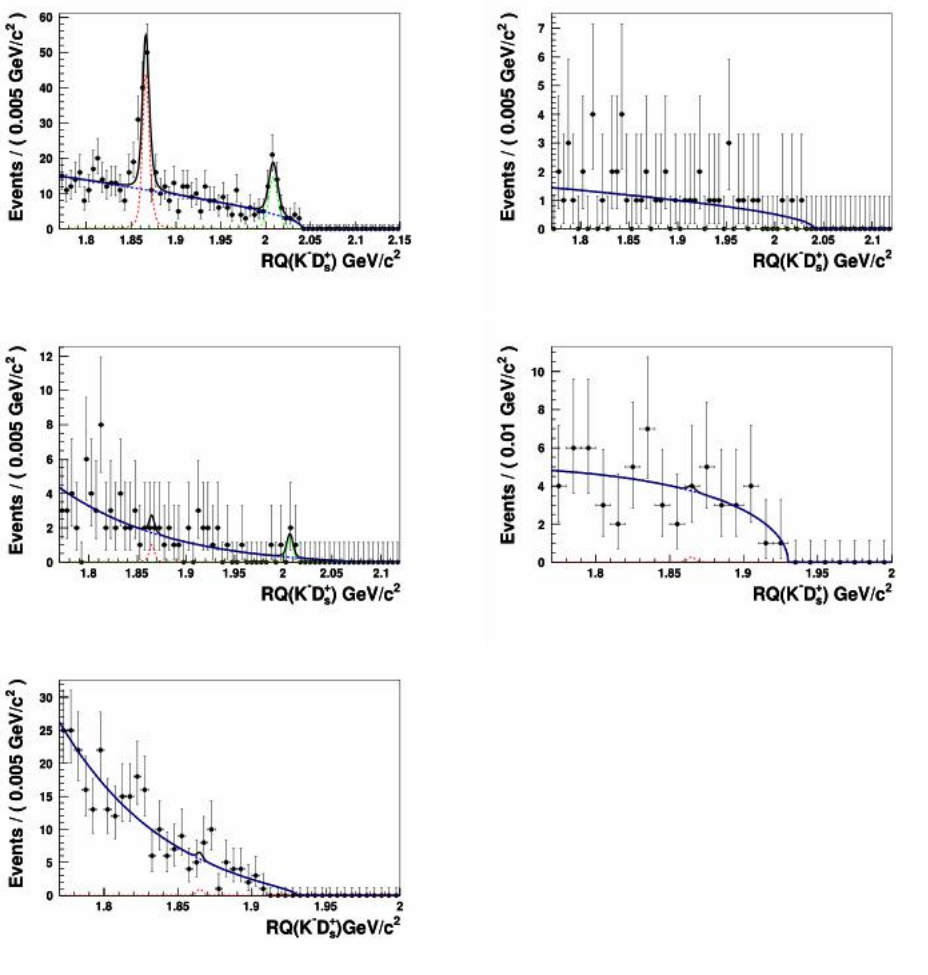


Figure 3.20 With the help of 'opencharm' MC sample, we get the threshold value of ARGUS function at different energy points. Points with error bars are MC samples and red lines are the ARGUS function. In the fit, the parameter k and the threshold m_0 of ARGUS function are float.

Figure 3.21 Fit to the $RQ(K^- D_s^+)$ spectrum at different energy points. Points with error bars are data, the red(green) line is signal shape for $D_s^+ \overline{D}^0 K^- (D_s^+ \overline{D}^{*0} K^-)$ process, and the blue line is the background shape.

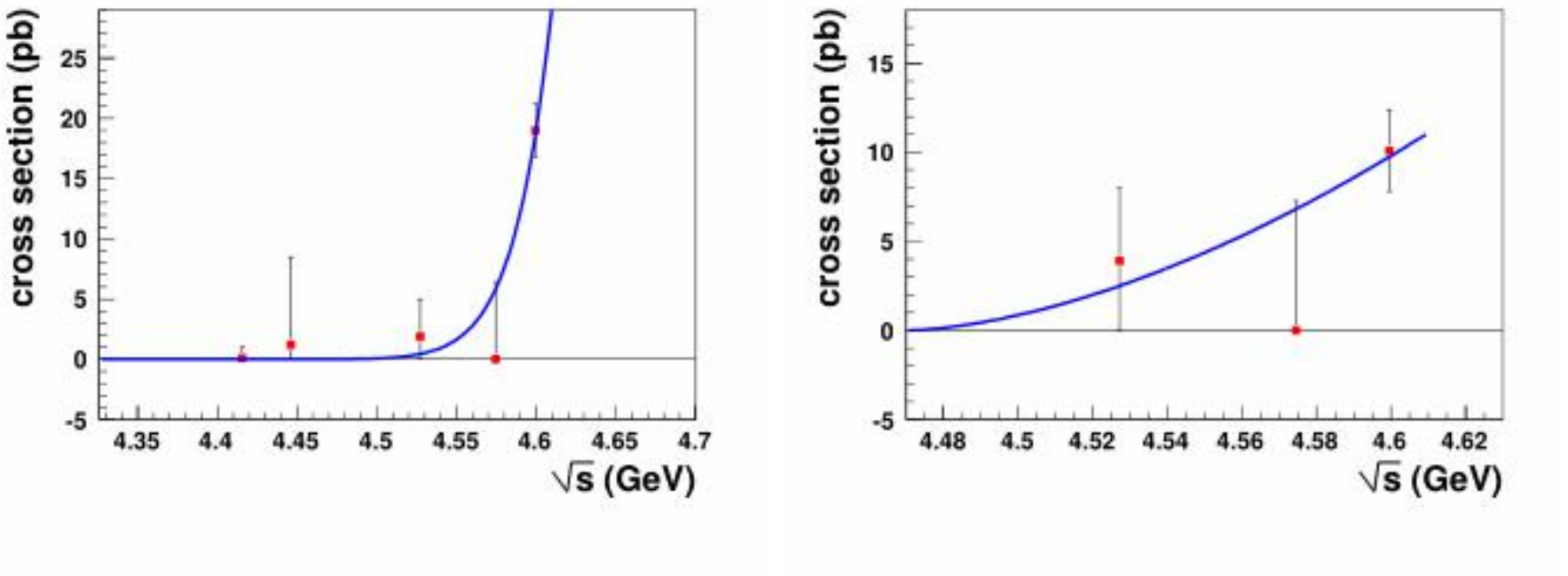
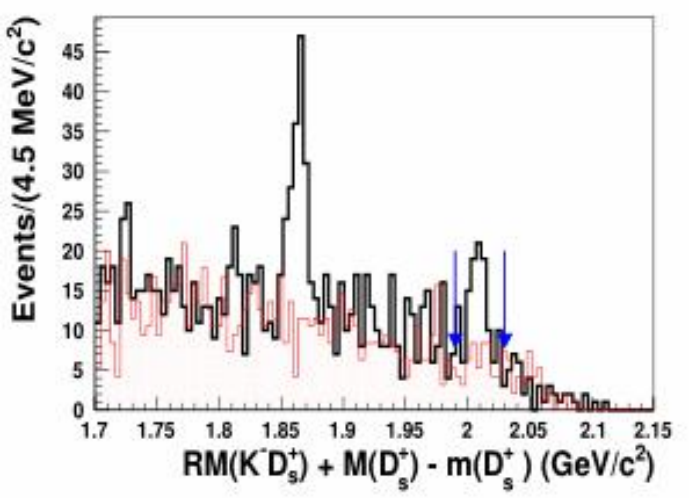
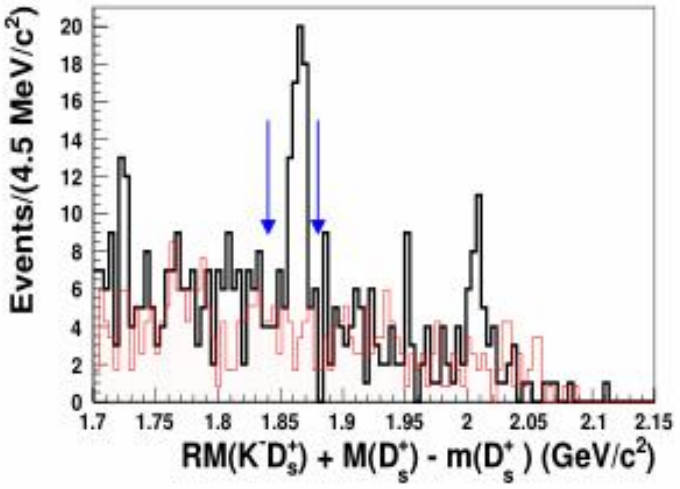


Figure 3.23 Fit to cross section lineshape.

what's the 'peak' around 1.72





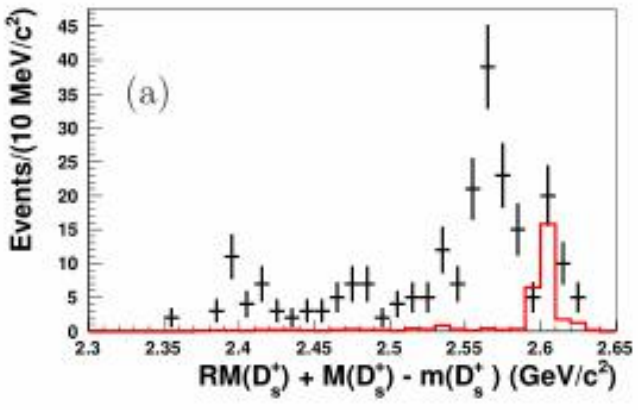
systematic uncertainties

$$\sigma^B(e^+e^- \to D_s^+ D_{s1}(2536)^-)\mathcal{B}(D_{s1}(2536)^- \to \overline{D}^{*0}K^-) = \frac{N_{obs}}{\mathcal{L}_{int}(1+\delta)\frac{1}{|1-\Pi|^2}\mathcal{B}\epsilon}$$

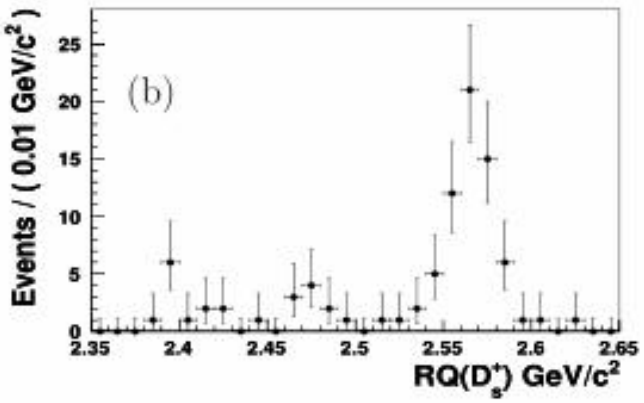
systematic uncertainties on

1. radiative correction factor
2. vacuum polarization factor

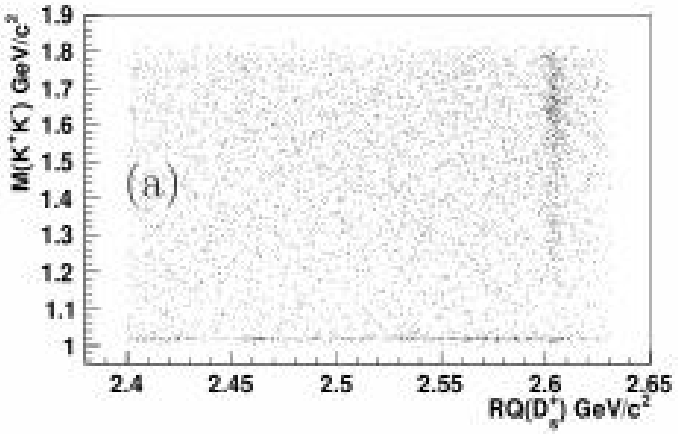
event cuts for Ds2



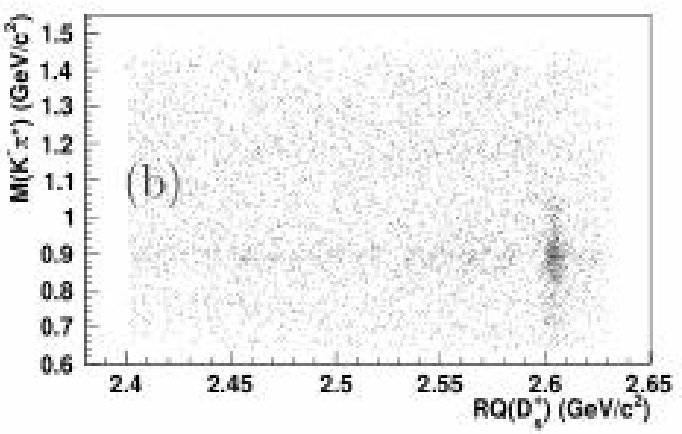
(a) Using D_s^+ candidates in region A and B to reconstruct the signal candidates. The histogram with red line is from $e^+e^- \to \Lambda_c^+\Lambda_c^-$ MC sample. Points with error bars are data.



(b) Using D_s^+ candidates in region A to reconstruct the signal candidates in data. Contribution from $e^+e^- \to \Lambda_c^+\Lambda_c^-$ is negligible, and one can get details in FigureA-21(f).



(a) Scatter plot of $M(K^-K^+)$ versus $RQ(D_s^+)$ in the process of $D_s^+ \to K^+K^-\pi^+$ in data. The horizontal band is from the $D_s^+ \to \phi\pi^+$ process and the vertical band produces the background peak around 2.6 GeV/c^2.



(b) Scatter plot of $M(K^-\pi^+)$ versus $RQ(D_s^+)$ in the process of $D_s^+ \to K^+K^-\pi^+$ in data. The horizontal band is from the $D_s^+ \to \overline{K}^*(892)\pi^+$ process and the vertical band produces the background peak around 2.6 GeV/c^2.

Figure A-15: Scatter plots of D_s^+ candidates selection in data.