

# Search for $\Xi^{--}$ Pentaquarks at HERMES

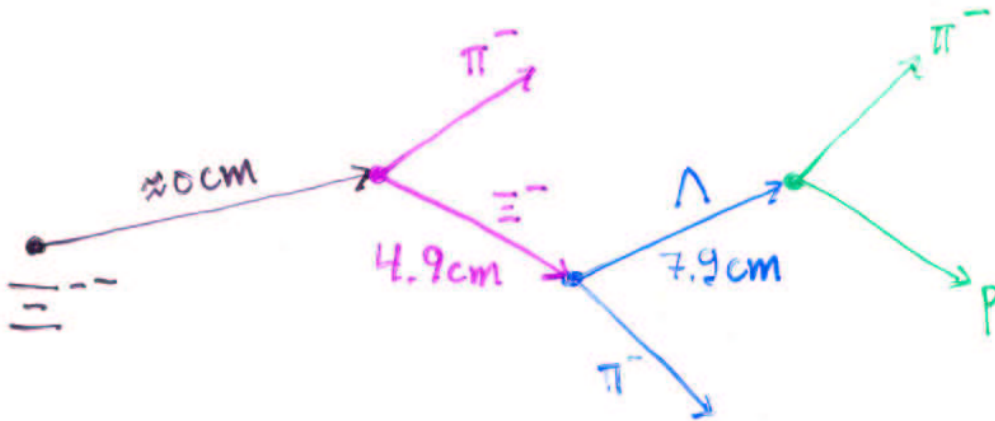
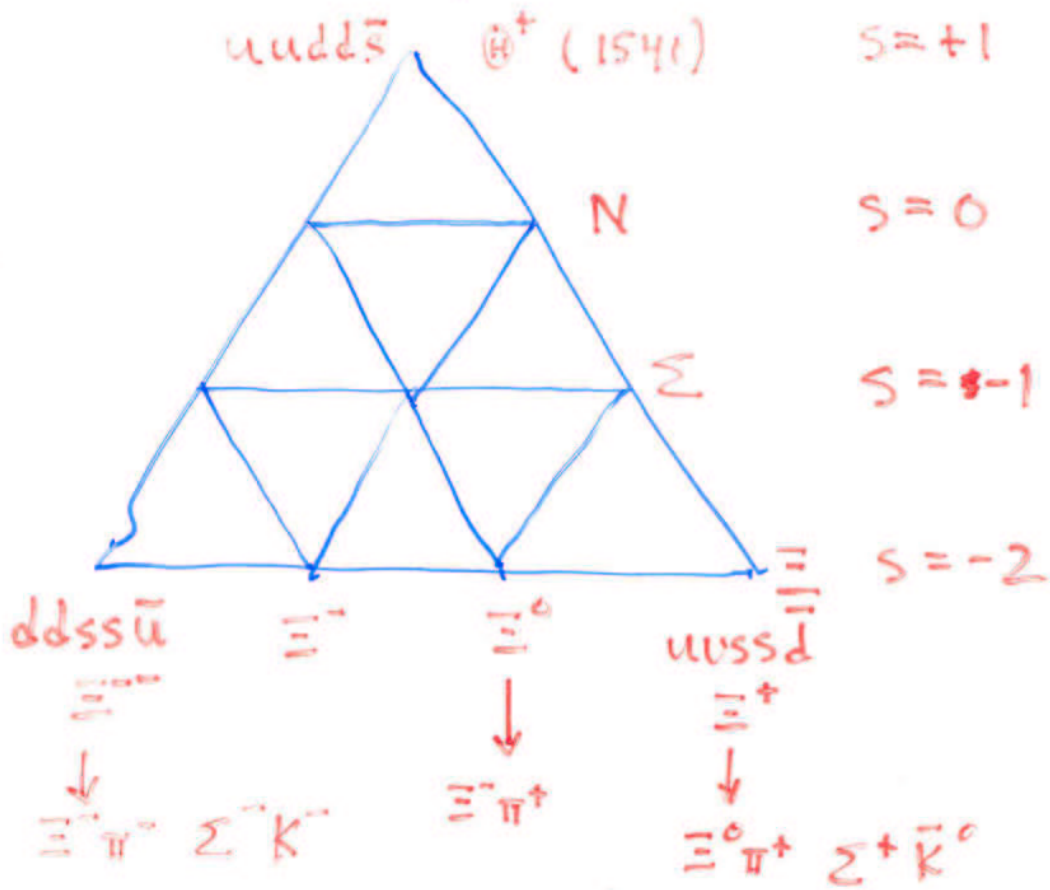
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*NIKHEF and College of William and Mary*  
November 2003

July 28, 2004

## **Abstract**

Various transparencies shown during my  $\Xi^{--}$  pentaquark analysis of September and October 2003.

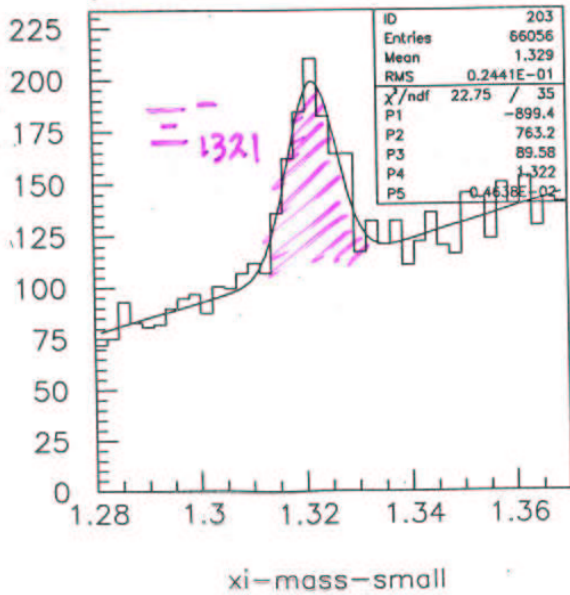
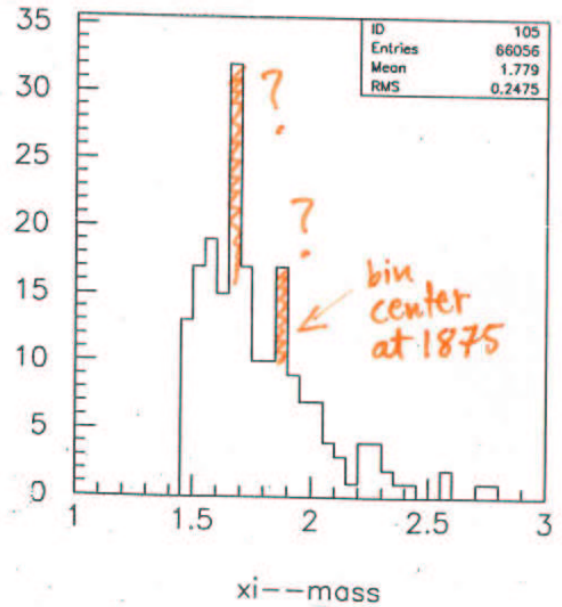
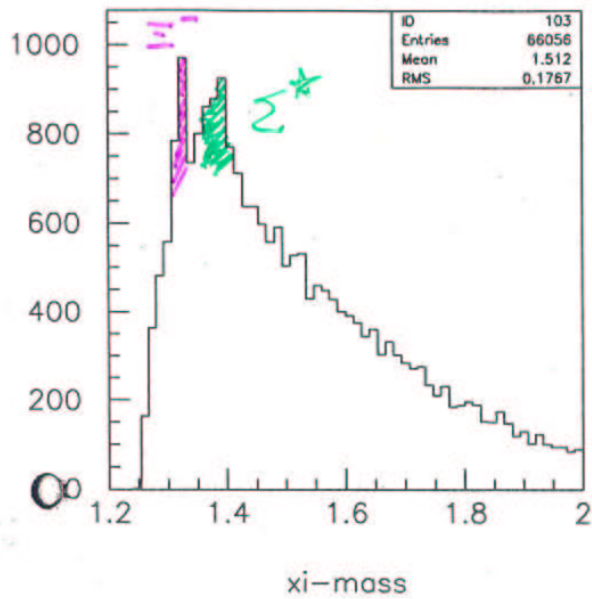
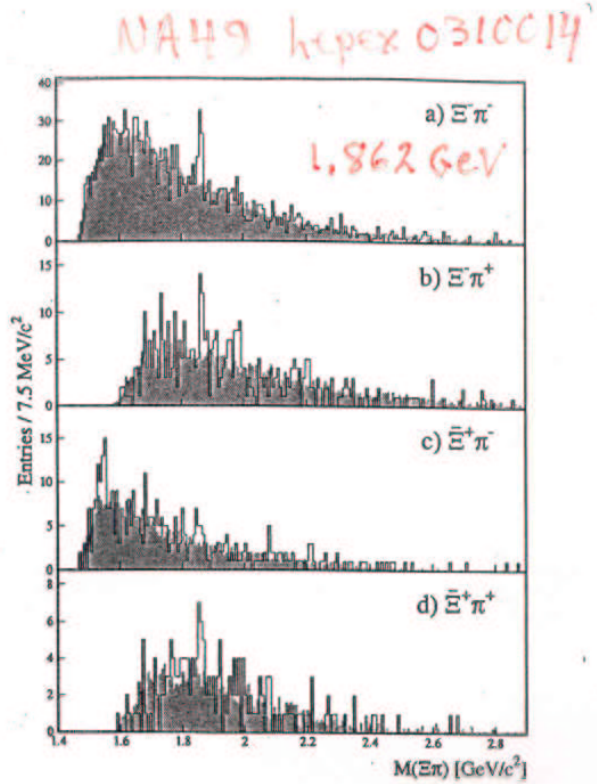
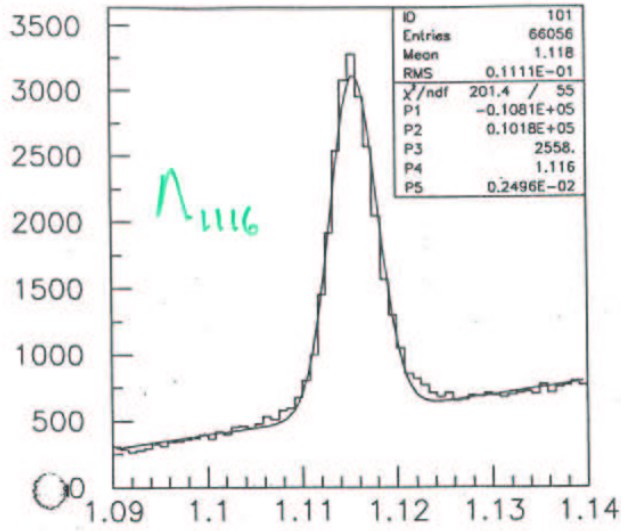
# Pentaquarks



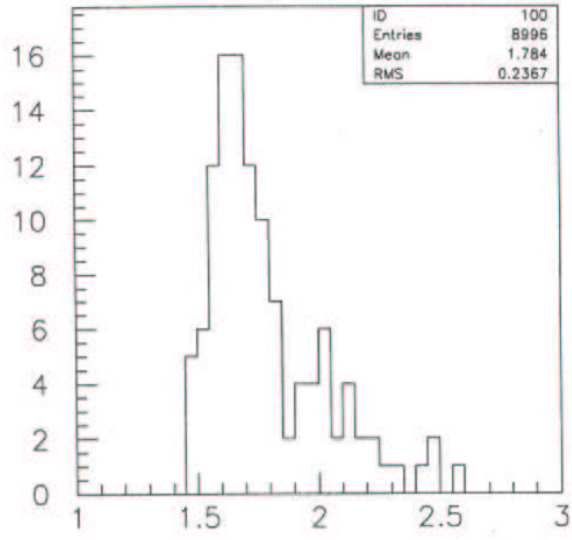
2

Can we find the  $\Xi^{*-}$  in Hermes data?

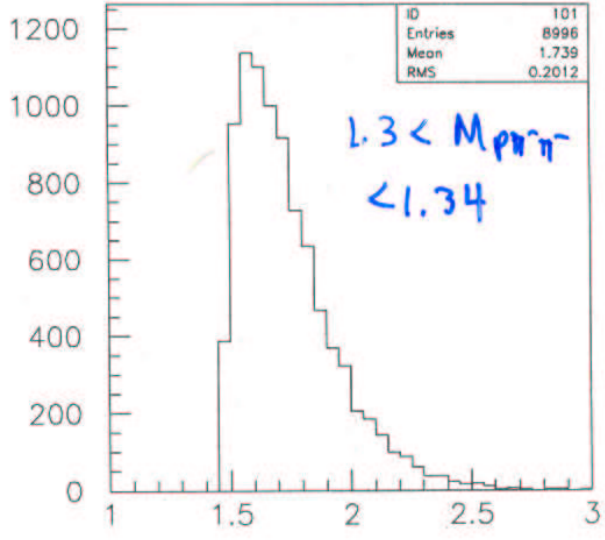
select events with  $p \pi^- \pi^- \pi^-$



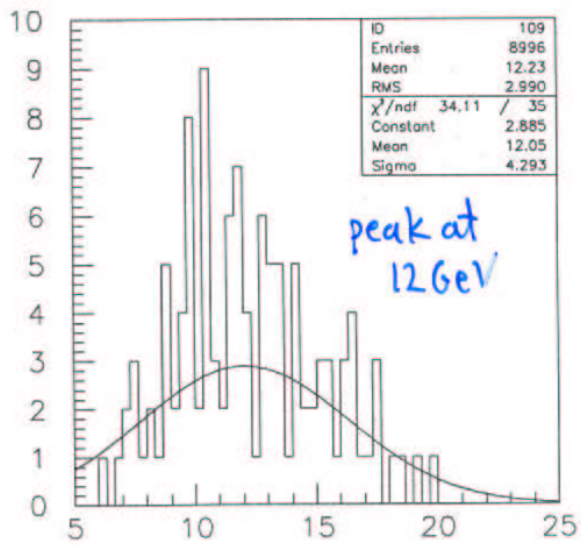
$M_{p\pi^-\pi^-\pi^-}$   $\rightarrow$  from another event



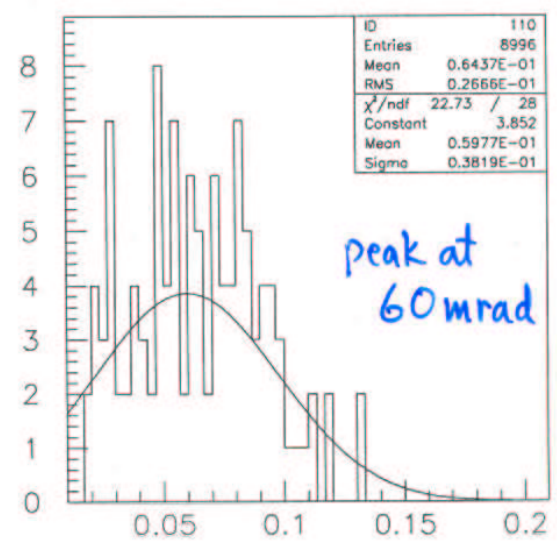
mass-spectrum



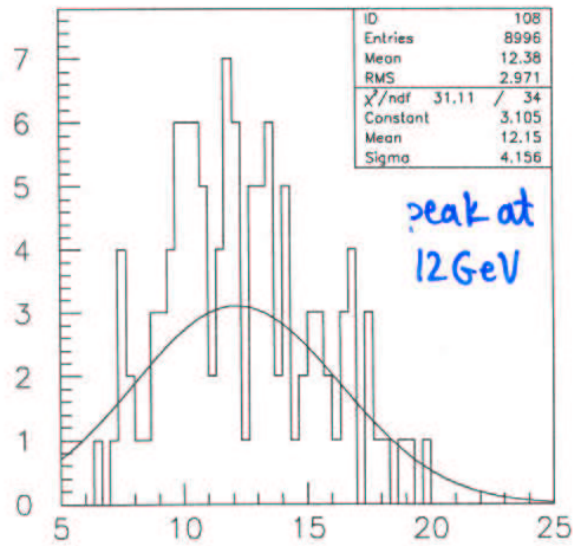
back-spectrum



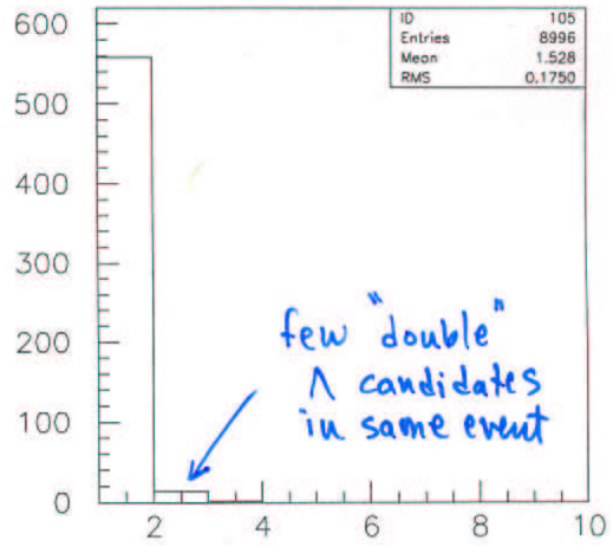
xi-- momentum



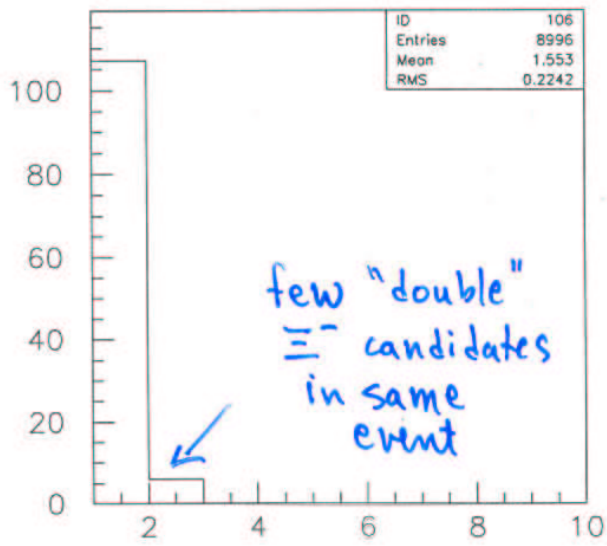
xi-- angle



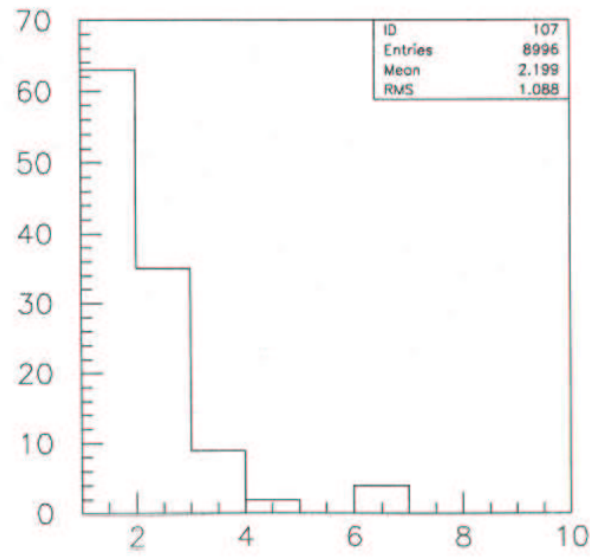
xi-- energy



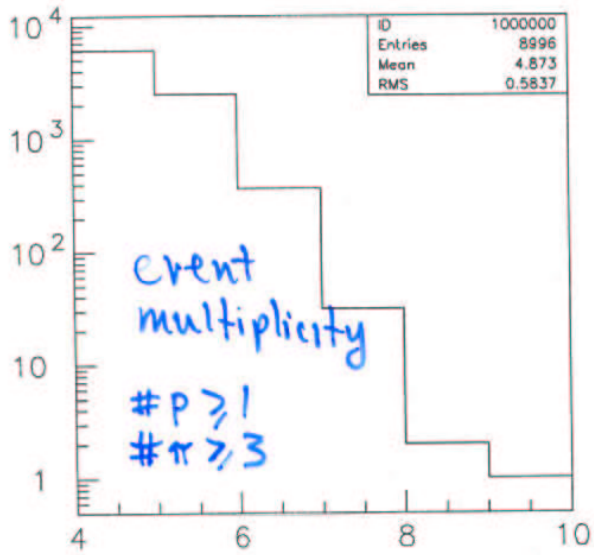
num-lambda



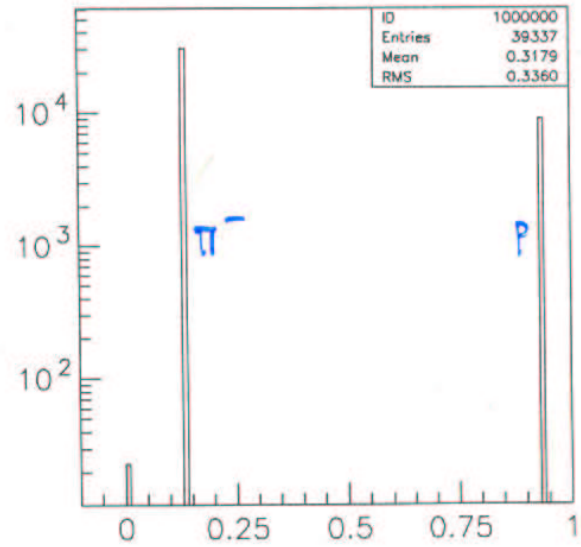
num-lambda



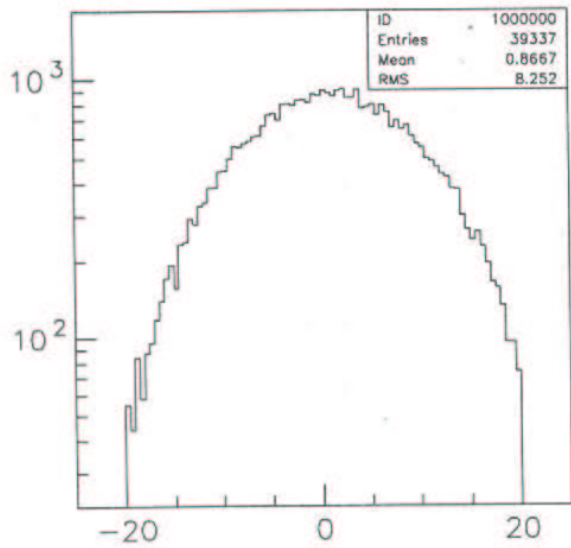
num-lambda



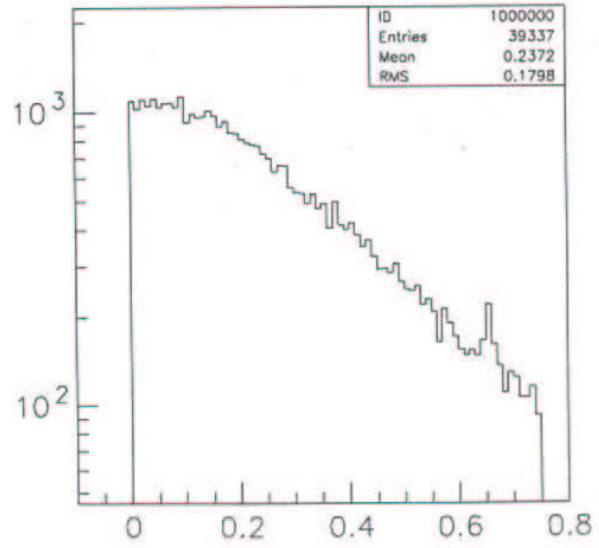
nrhd



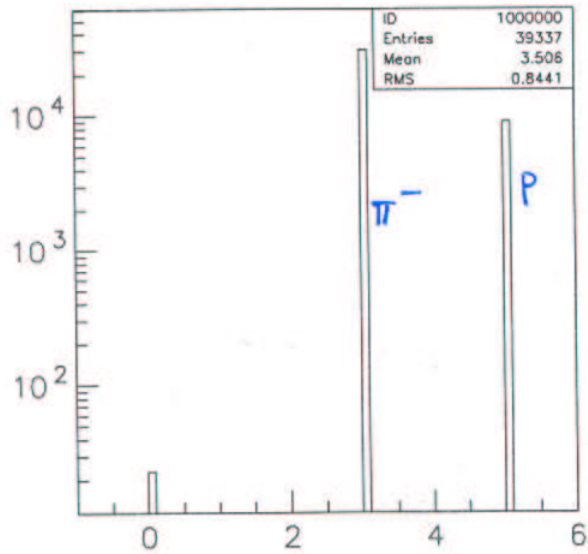
rmass



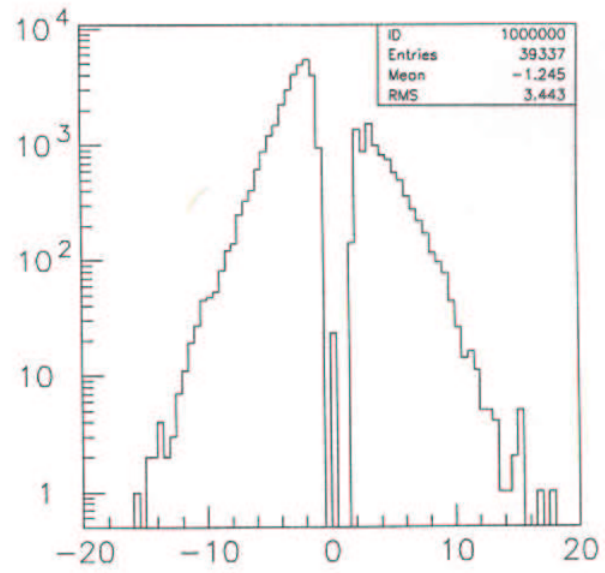
zvertex



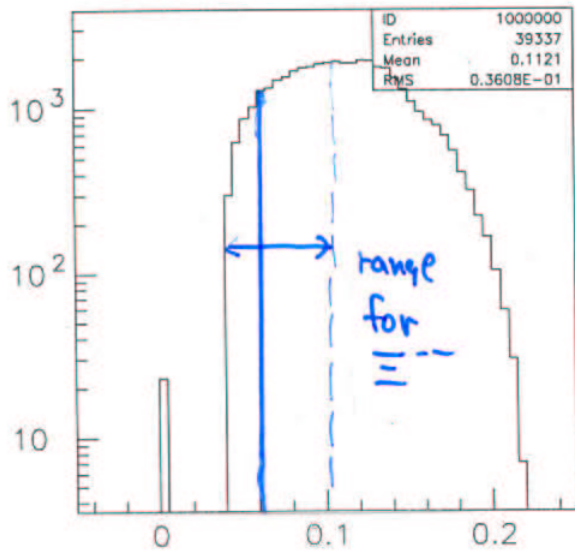
dvertex



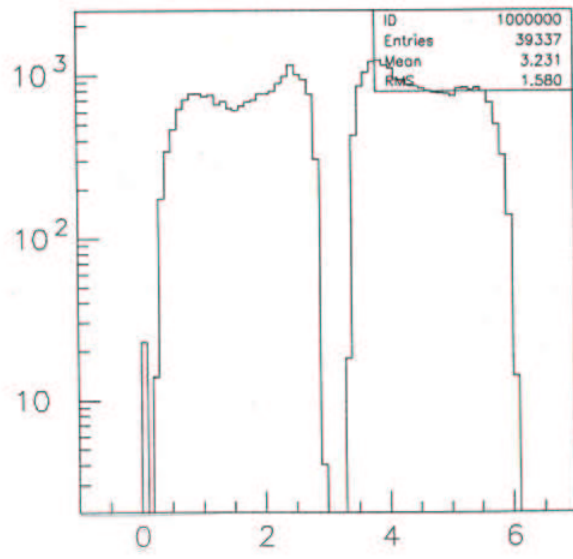
richid



enhad



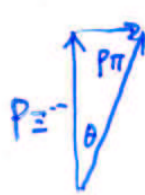
thetahad



phihad

$\Xi^{--} \sim 1,750 \text{ MeV}$   
 $\Xi^- = 1,321 \text{ MeV}$   
 $\Lambda = 1,116 \text{ MeV}$   
 $p = 0,938 \text{ MeV}$   
 $\pi = 140 \text{ MeV}$

$\Xi^{--} \rightarrow \Xi^- + \pi^- \quad p_{cm} = 0.36 \text{ GeV}$   
 $\Xi^- \rightarrow \Lambda + \pi^- \quad p_{cm} = 0.14 \text{ GeV}$   
 $\Lambda \rightarrow p + \pi^- \quad p_{cm} = 0.10 \text{ GeV}$

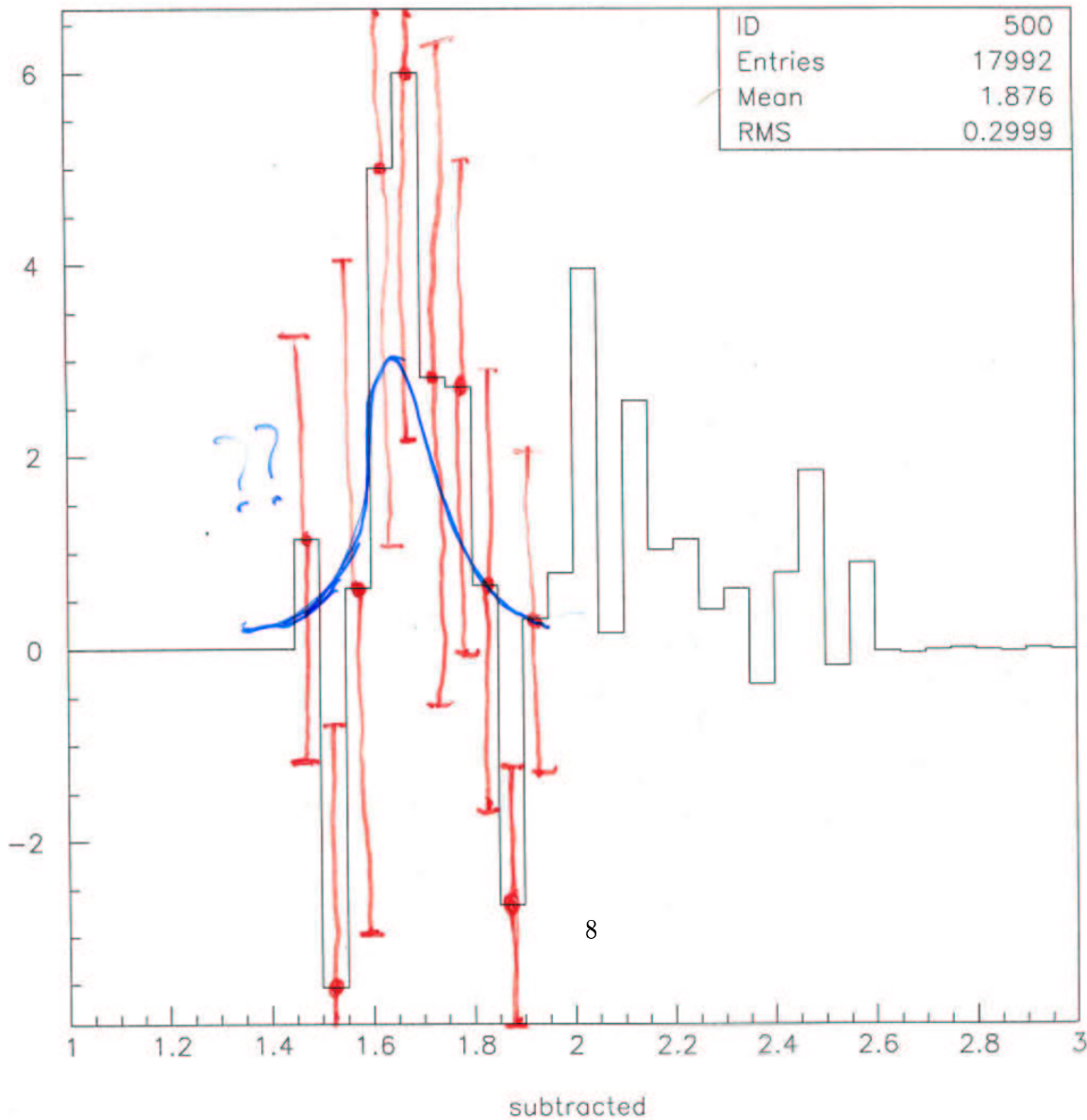


$\cos \theta \approx 1 - \frac{\theta^2}{2}$   
 $\theta \approx \frac{P_{\pi^-}}{P_{\Xi^{--}}}$   
 $\theta_{max} \approx \frac{0.36}{5} \quad \frac{\theta^2}{2} = 0.0026$

resolution: 3mrad

$d \cos \theta = \theta d\theta = .0720 \times .003 = 2 \times 10^{-4}$

signal - .01 \* background





lin  $\equiv$

$\cos \theta_{\pi^- \pi^-} \approx 1 - \frac{\theta^2}{2}$

dominant

$+ \cos \theta_{\pi^- \Lambda} \approx 1$

$+ \cos \theta_{\pi^- p} \approx 1$

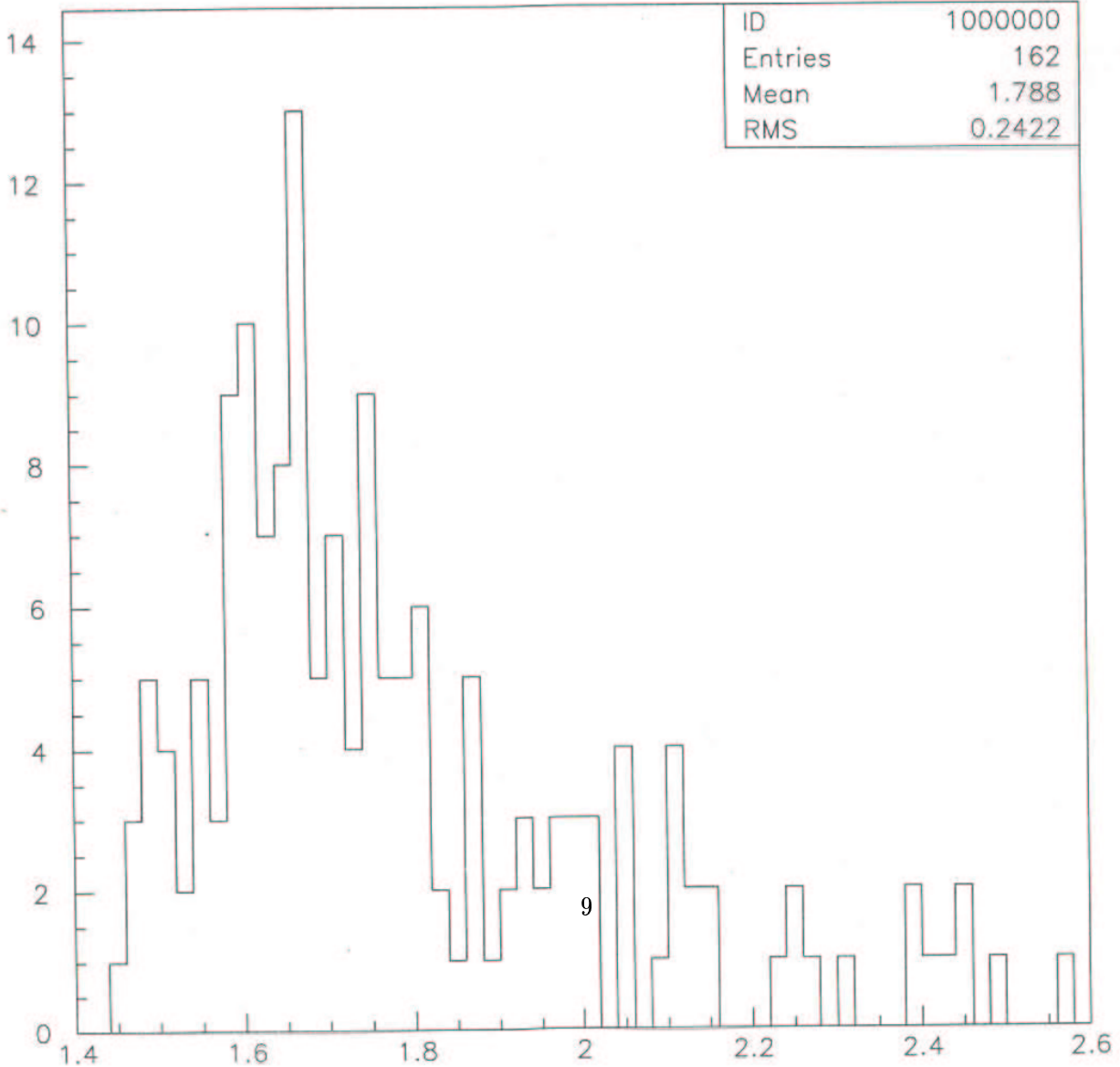
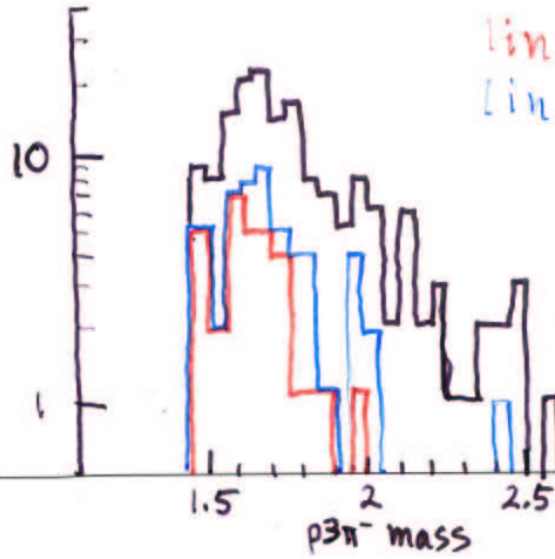
$\frac{\theta^2}{2} < .0026$

$\Rightarrow \text{lin} < 2.9974$

no cut

$\text{lin} > 2.998$

$\text{lin} > 2.995$



mass4.f