

# K0 Mass Studies in MIPP

Matt Mikels

Indiana University

August 10<sup>th</sup>, 2006

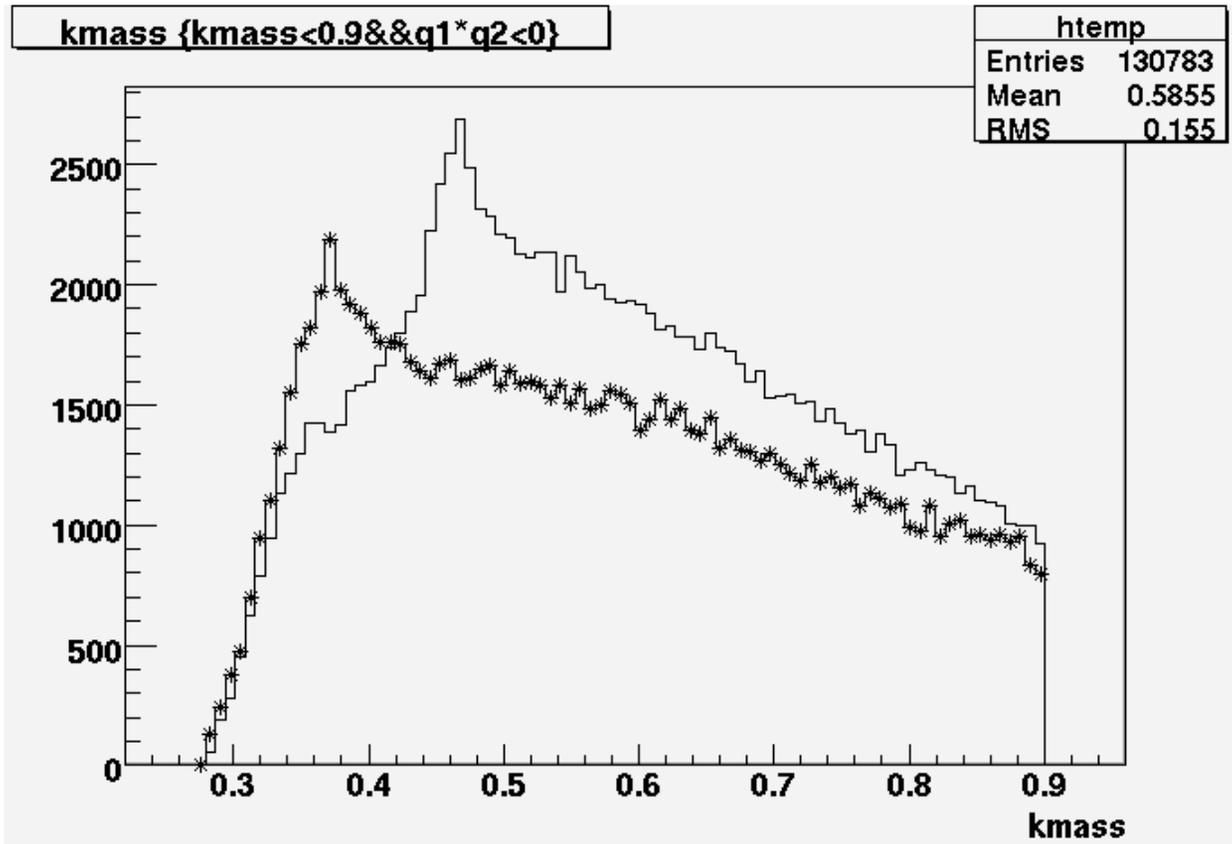
# Motivation

- The goal of this project is to be able to track the kaon mass through run numbers and targets.
- This is to see if there are any shifts in the fitted mass, and if there are, to understand what caused them to occur.
- This is based on the work that Nick Solomey has done earlier.

# Data

- The data used in the results to follow was a collection of 65 sub-runs of the LH2 data, or about 255,500 events.
- All combinatorial pairs of tracks were found in each event. Tracks that had more than 6 positive or negative tracks, or tracks that had momentum greater than 20 GeV/c or less than 0.2 GeV/c were rejected.

# Raw Plot

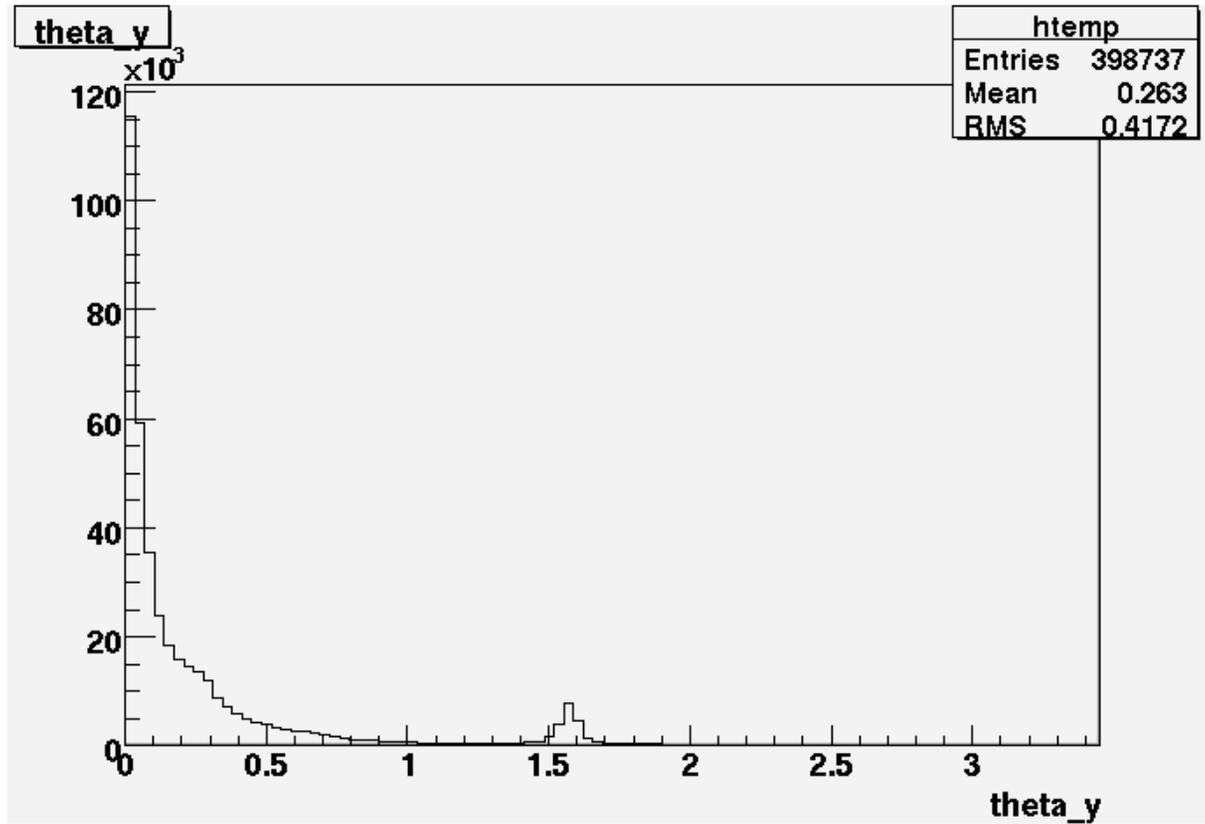


The raw, uncut K0 mass plot. The starred plot is the same charged events, while the unstarred is for the opposite charged events.

# Cuts

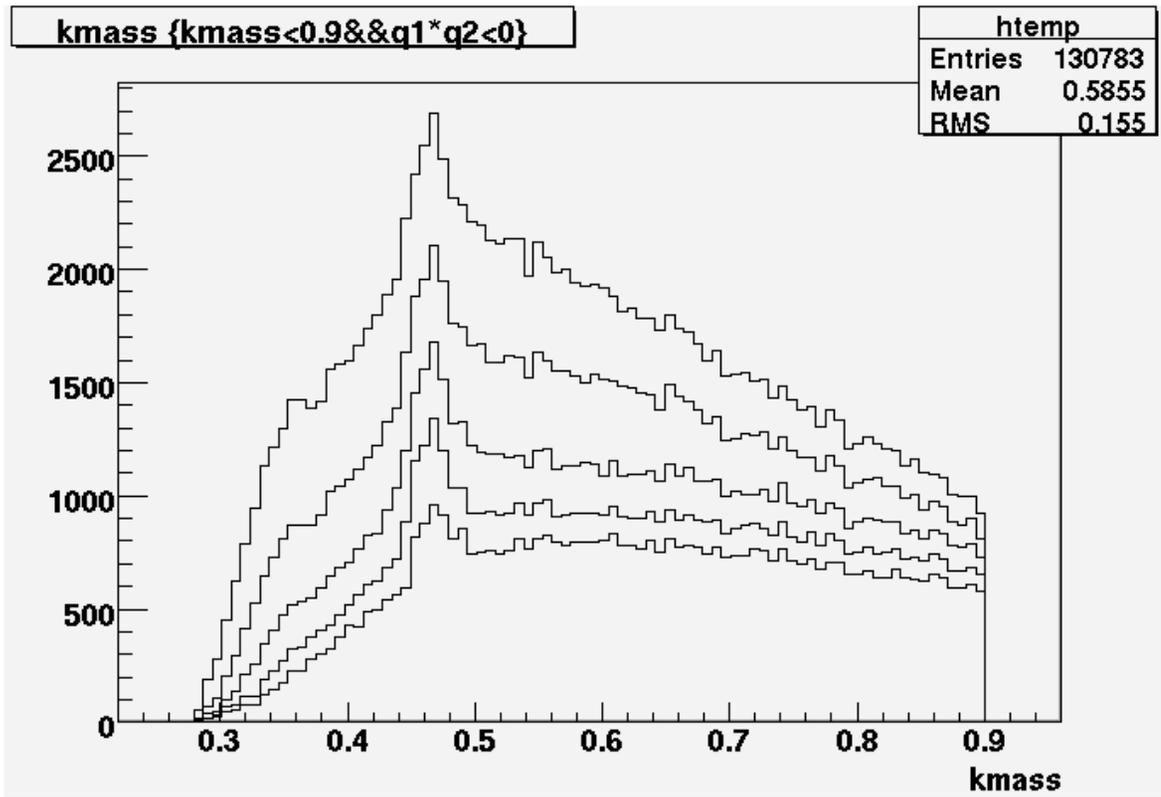
- Apart from the two cuts already in the data (momentum, track numbers), another cut was added to clean up the data.
- The opening angle in the y-z plane,  $\theta_y$ , was studied.

# $\theta_y$



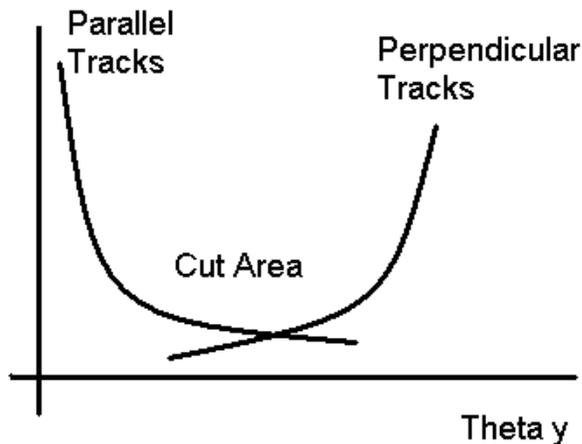
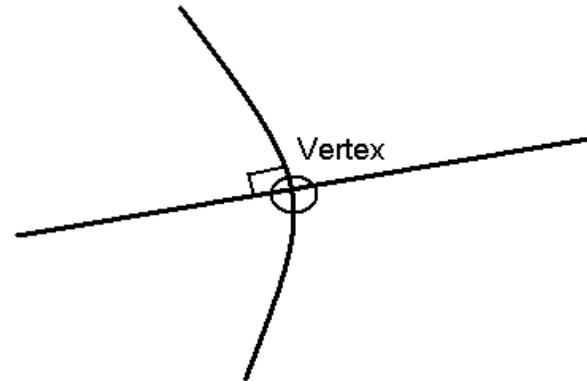
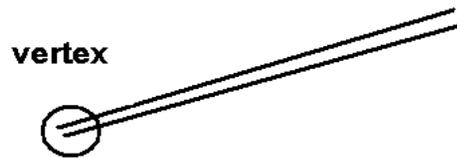
The  $\theta_y$  distribution.

# Motivation for the cut



This plot show making progressively larger cuts on the raw, opposite charge plot, starting with the uncut plot and going up by 0.02 increments.

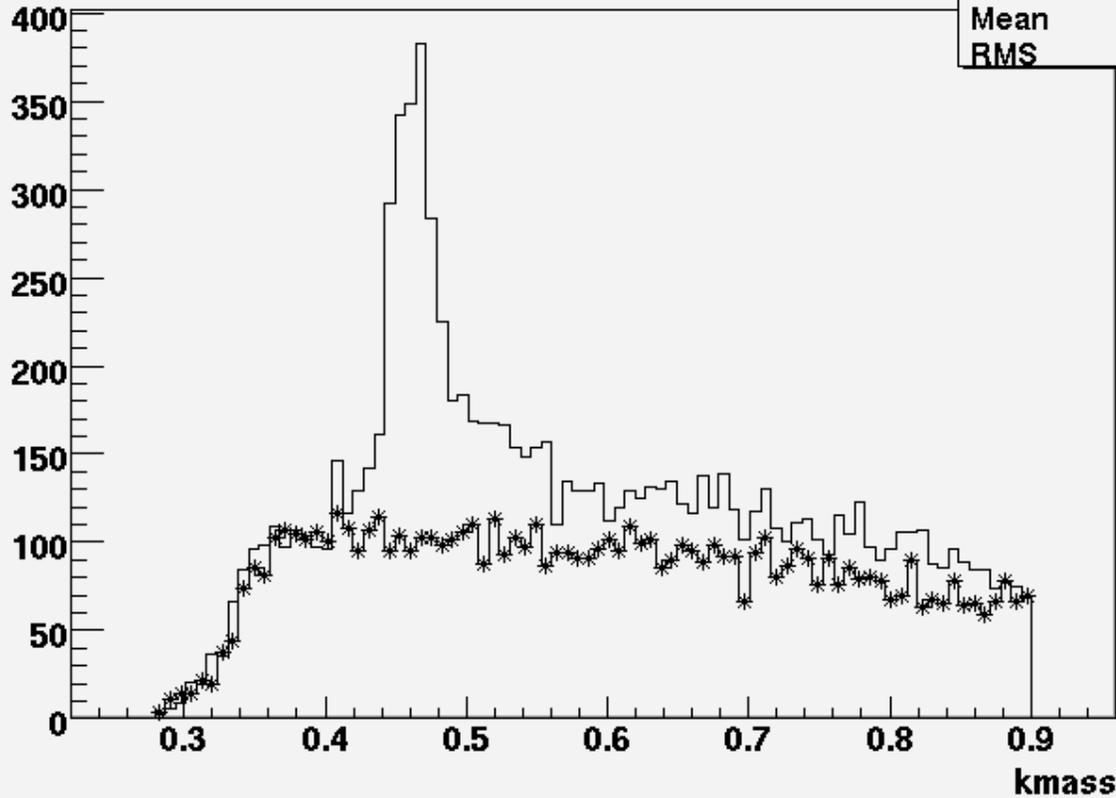
$\Theta_y > 0.06$  seems to be the maximum point, since after that, the peak begins to shrink.



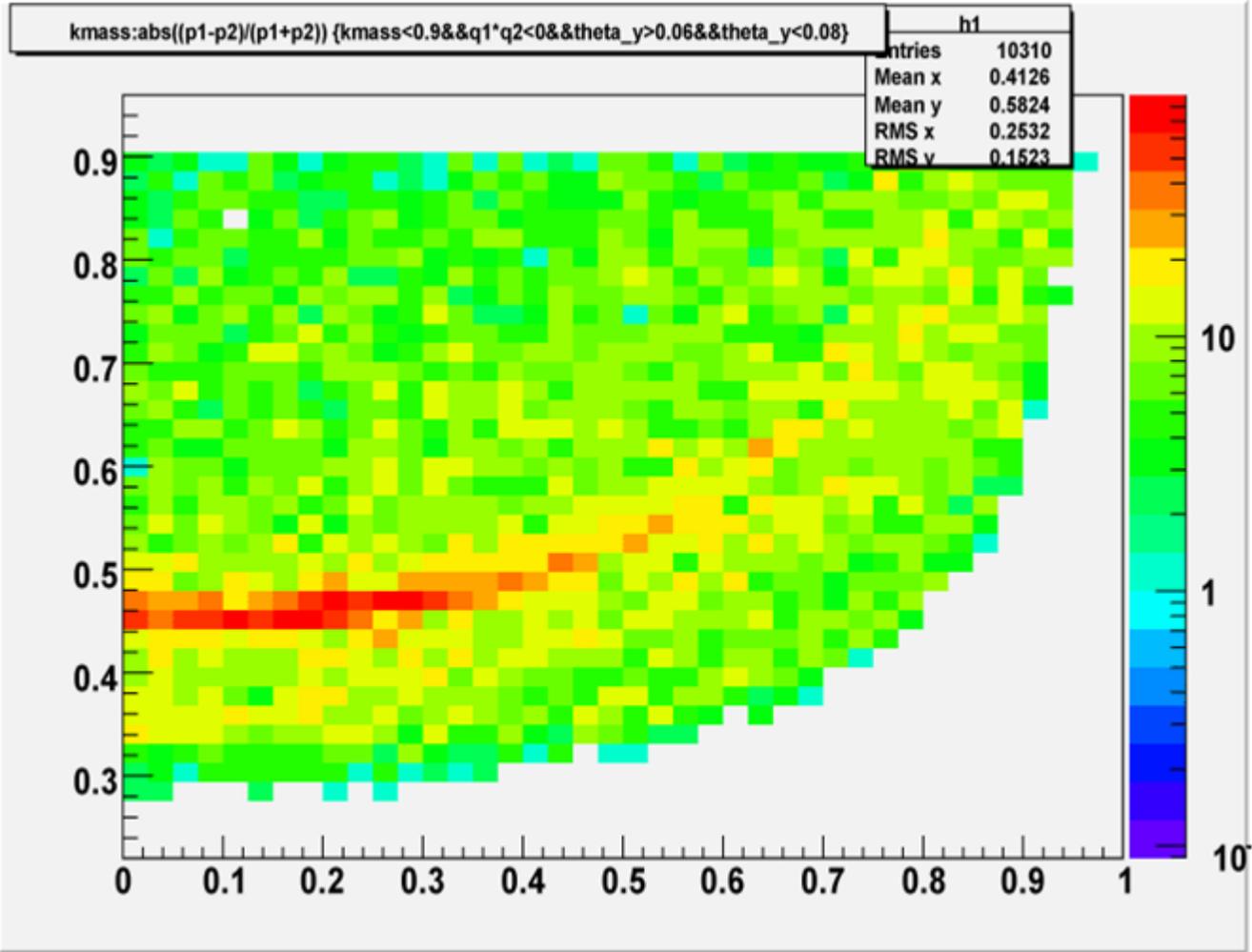
One explanation for why this cut works is that there are sets of tracks like the ones seen here, that are not from the kaon, but are thought as such by the reconstruction and the macro. The cut eliminates these, if  $\theta_y$  is taken between 0.06 and 0.08.

kmass {kmass<0.9&&q1\*q2<0&&theta\_y>0.06&&theta\_y<0.08}

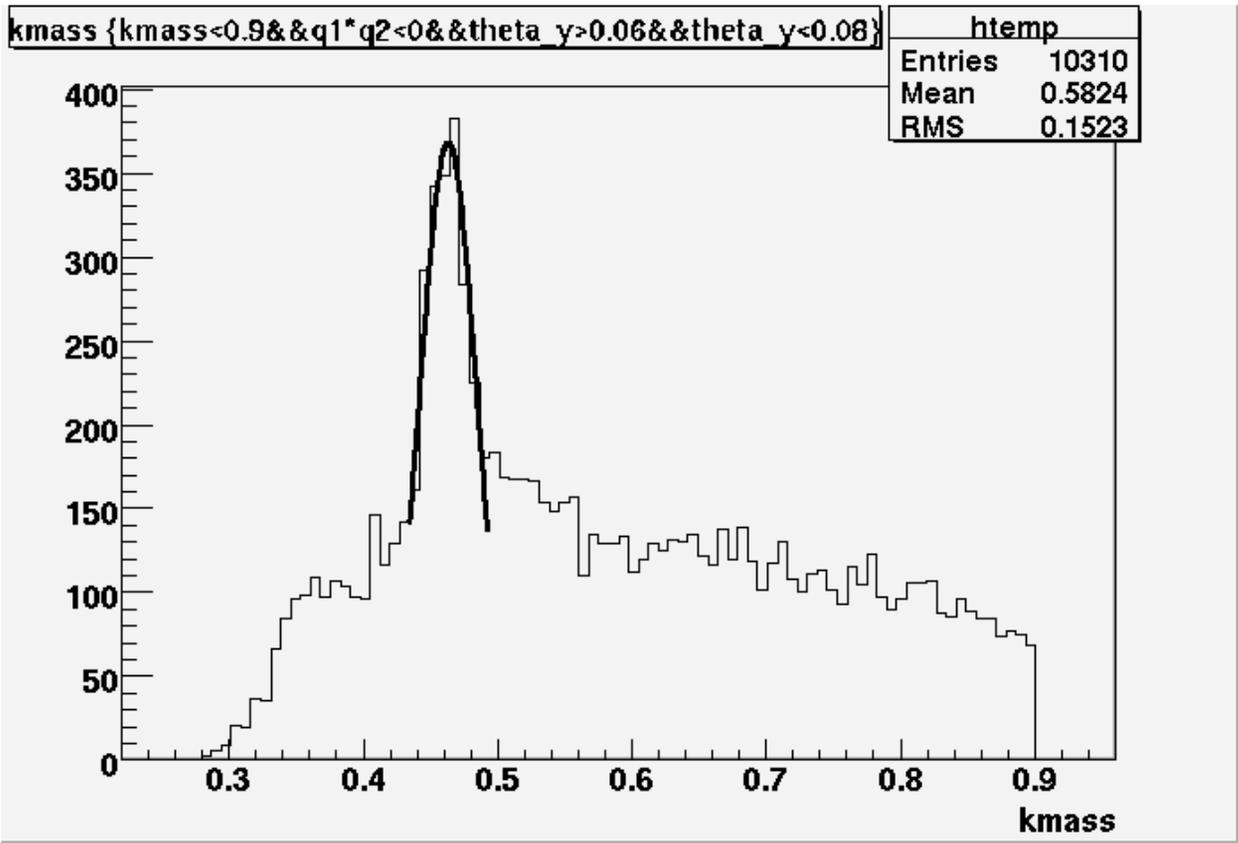
htemp	
Entries	10310
Mean	0.5824
RMS	0.1523



After the  $\theta_y$  cut is added, a peak emerges, as seen here. The starred plot is the same charge events.



The kaon mass vs. the momentum asymmetry of the two tracks,  $(p1-p2)/(p1+p2)$ . A nice band of kaons is seen in red.



Fit of the peak to a gaussian.

Constant =  $368.3 \pm 10.99$

Mean =  $463.1 \text{ MeV} \pm 0.623 \text{ MeV}$

Width =  $20.86 \text{ MeV} \pm 0.855 \text{ MeV}$

# Next steps

- As stated before, other targets and run numbers will be studied in order to see if there are any changes to the fitted mass.
- More results soon!