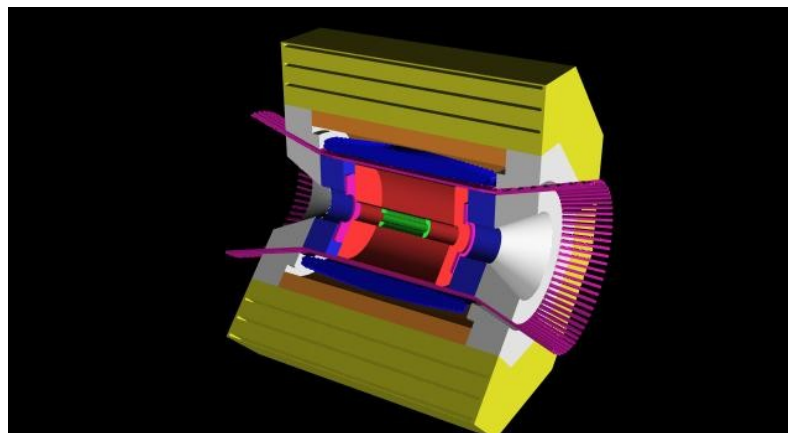


A Dalitz Analysis of $D^0 \rightarrow K_s^0 \pi^0 \pi^0$ in CLEO III and CLEO II.V

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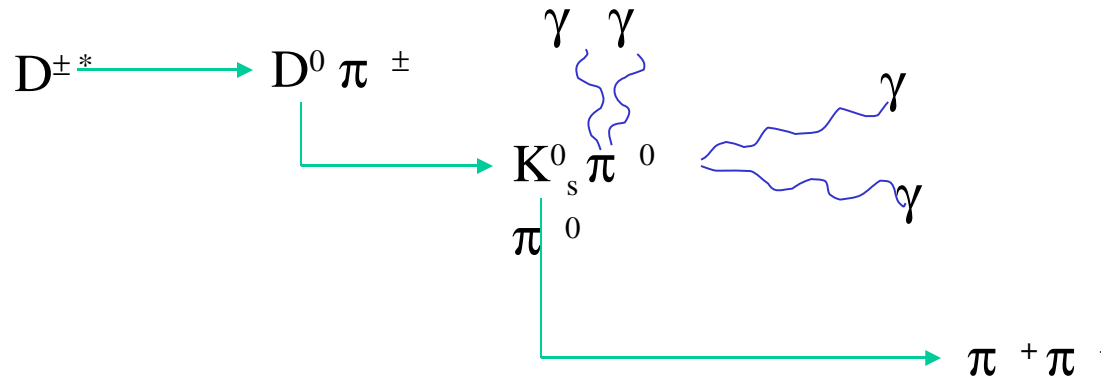
Overview

- Motivation
- How to find
- Current progress
- Preliminary Results
- Conclusions

Why look at $D^0 \rightarrow K_s^0 \pi^0 \pi^0$?

- No absolute branching ratio in PDG.
- Look for interesting decays to $\pi^0 \pi^0$.
- Possible to see the $\sigma(500)$?
- Test K-matrix formalism
- CLEO also has a large amount of data available (CLEO III and CLEO II.V)

How to find $D^0 \rightarrow K_s^0 \pi^0 \pi^0$?

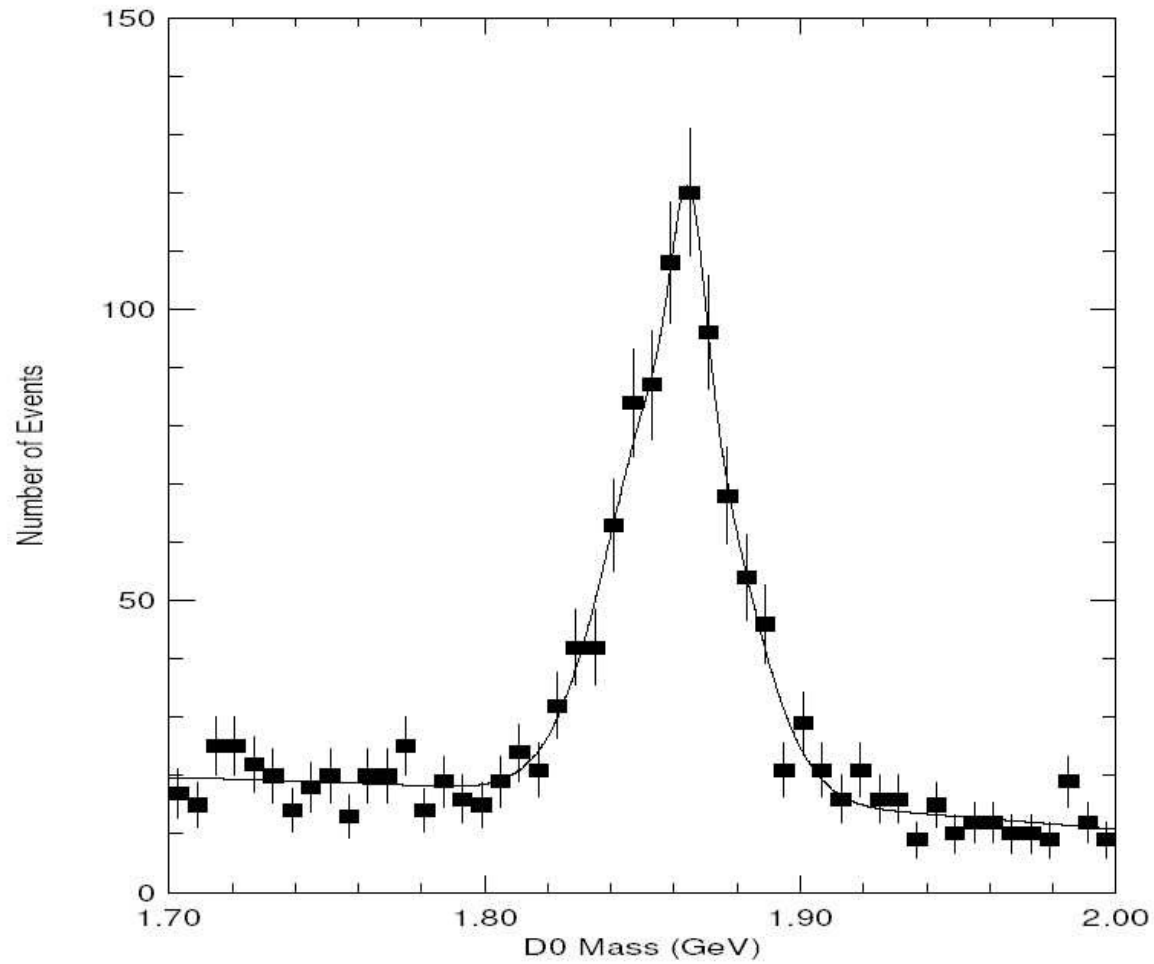


Look for a slow pion with a D^0 candidate to form a $D^{*\pm}$.
Then look for $K_s^0 \pi^0 \pi^0$. I will use the mass difference between the $D^{*\pm}$ and the D^0 as a cut on the data. I will also look for continuum D's so that the momentum will be quite high so that we can cut on the charged (slow) pion as well as on the $D^{*\pm}$.

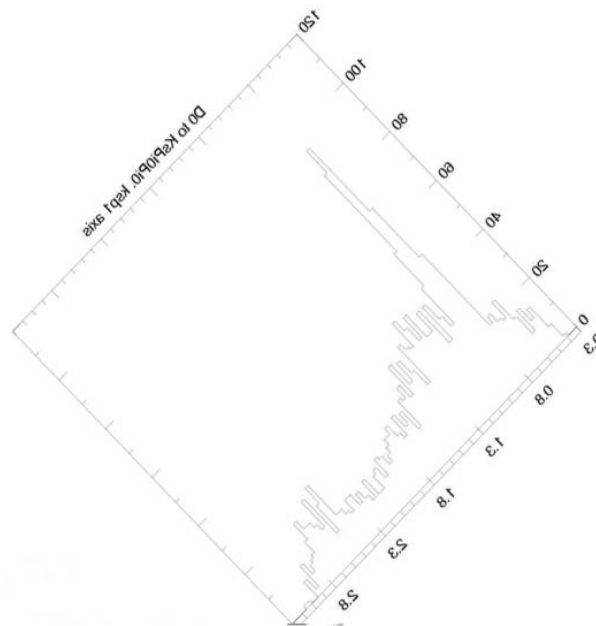
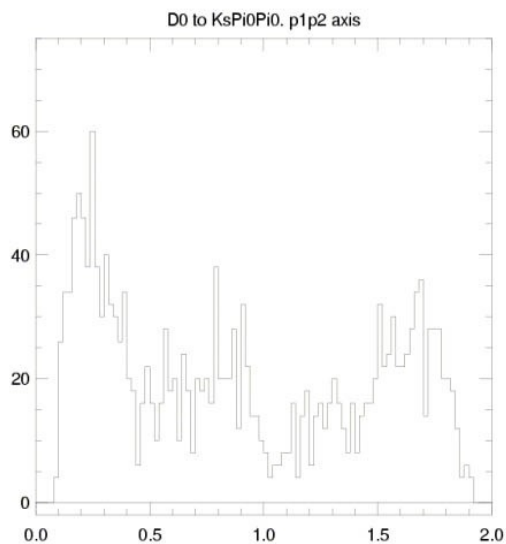
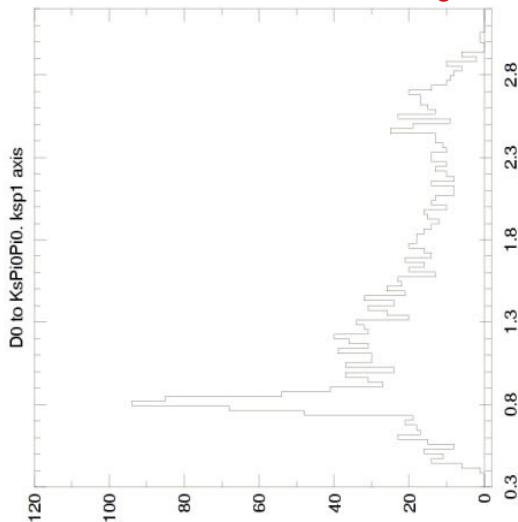
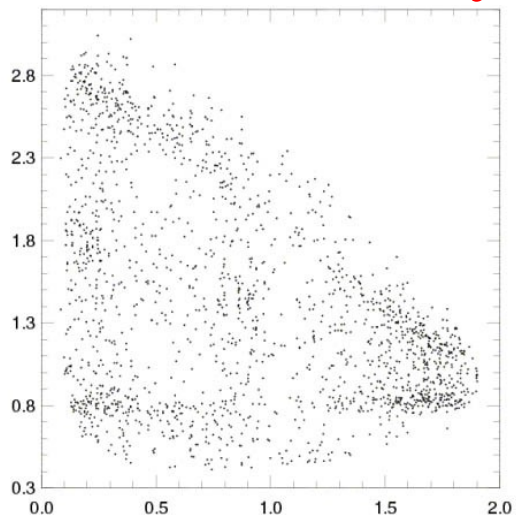
What has been done?

- We have run over most of CLEO III ($\sim 8.89 \text{ fb}^{-1}$) and CLEO II.V ($\sim 8.43 \text{ fb}^{-1}$) data.
- Found a branching ratio
- Generated Monte Carlo to find efficiency over the Dalitz Plot
- Looked at sidebands to find the background.
- Used an unbinned maximum likelihood fitter to fit the Dalitz Plot.

Finding the Peak in Data

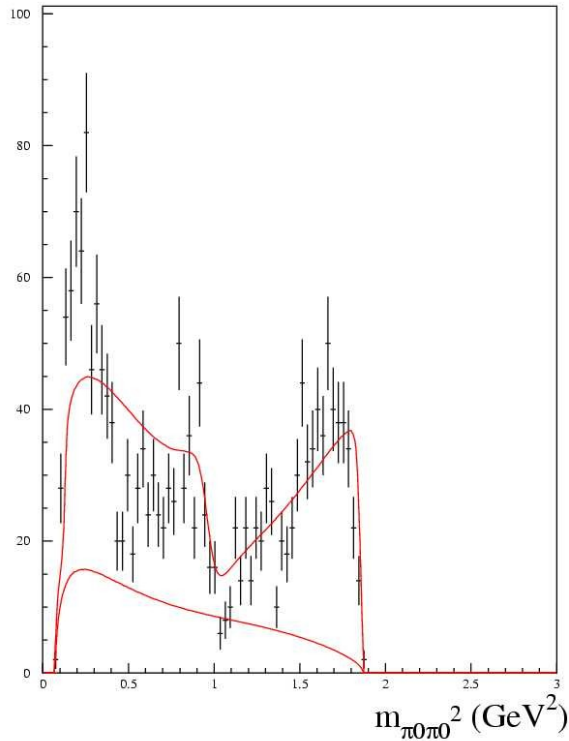


Dalitz Analysis (Preliminary)

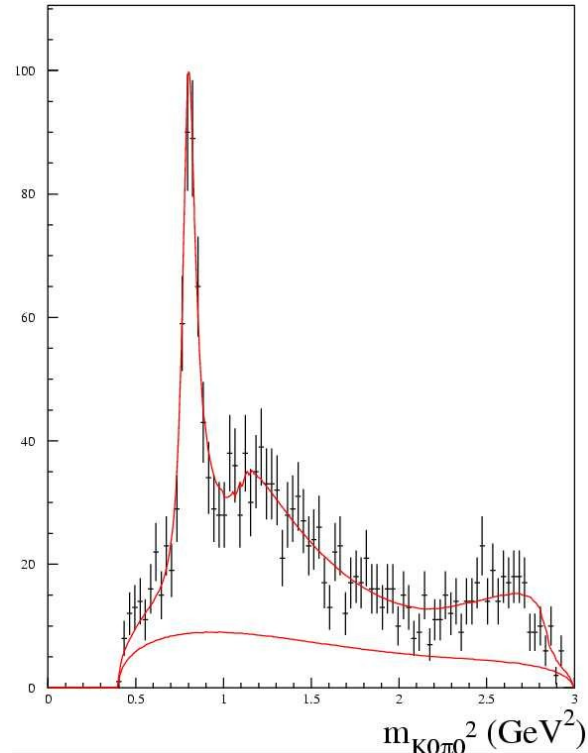


Projections without any broad resonances (Preliminary)

$D^0 \rightarrow K^0 \pi^0 \pi^0$ Data - X projections

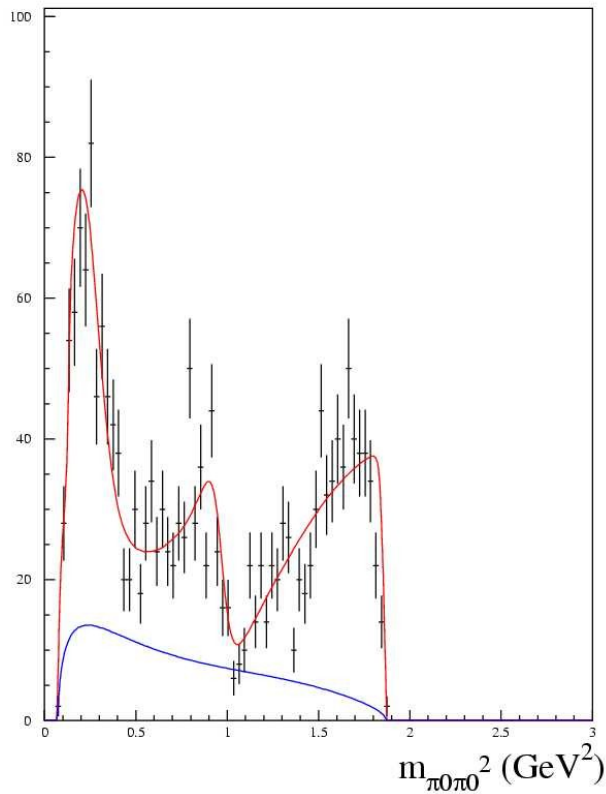


$D^0 \rightarrow K^0 \pi^0 \pi^0$ Data - Y projections

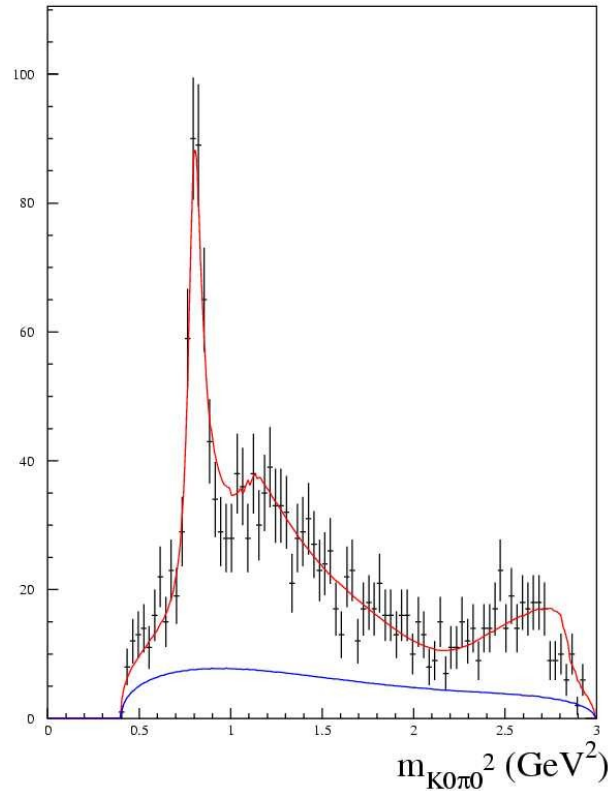


Projections with the $\sigma(500)$ (Preliminary)

$D^0 \rightarrow K^0 \pi^0 \pi^0$ Data - X projections



$D^0 \rightarrow K^0 \pi^0 \pi^0$ Data - Y projections

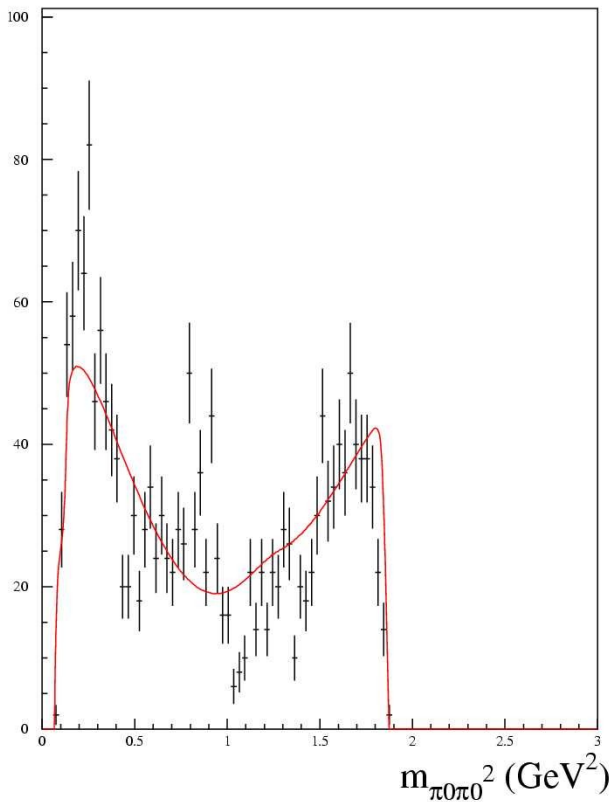


K-matrix Formalism in a Nutshell

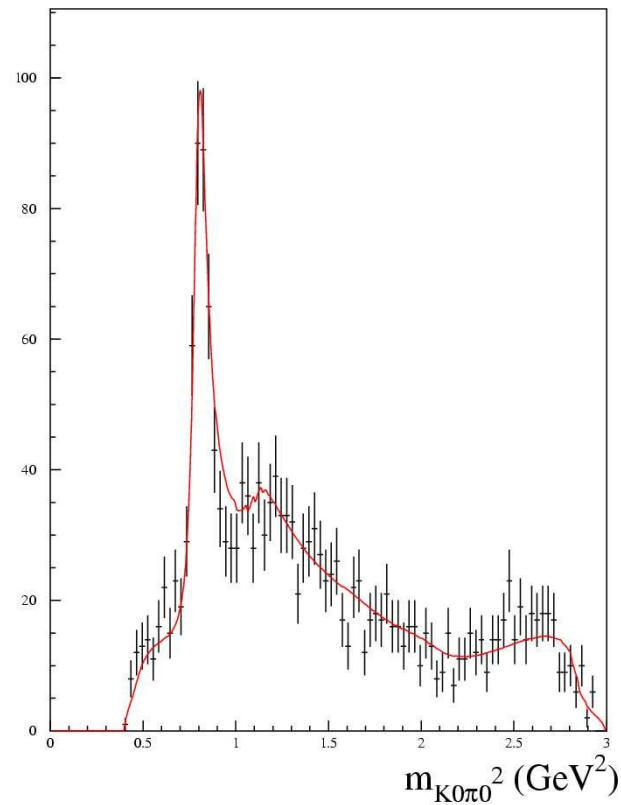
- Uses a Scattering matrix instead of a series of Breit-Wigner amplitudes
- The scattering matrix has several mass “pole” terms which correspond to real resonances and a complex background term.
- The $\sigma(500)$ come from the background term and are not real resonances.

Now, with K-matrix formalism (Very Preliminary)

$D^0 \rightarrow K^0 \pi^0 \pi^0$ Data - X projections



$D^0 \rightarrow K^0 \pi^0 \pi^0$ Data - Y projections



Conclusions/Future Work

- Need some type of broad resonance
- K-matrix formalism in the works
 - Need $\pi\pi$ d-wave
 - Need $K\pi$ s-wave
- Eventually need to compare the two and find differences.
- Work on the branching ratio and errors on the ratio