

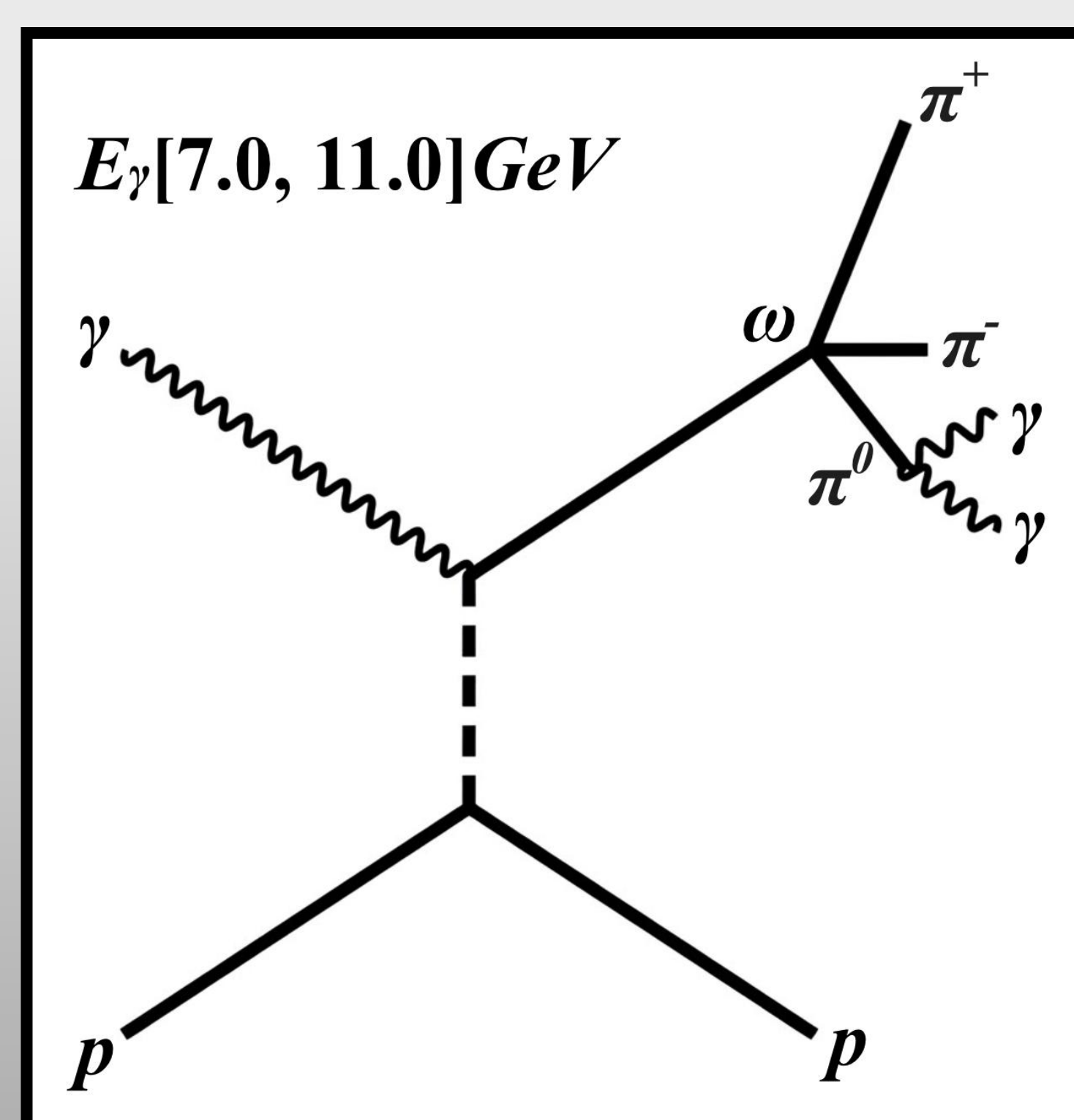
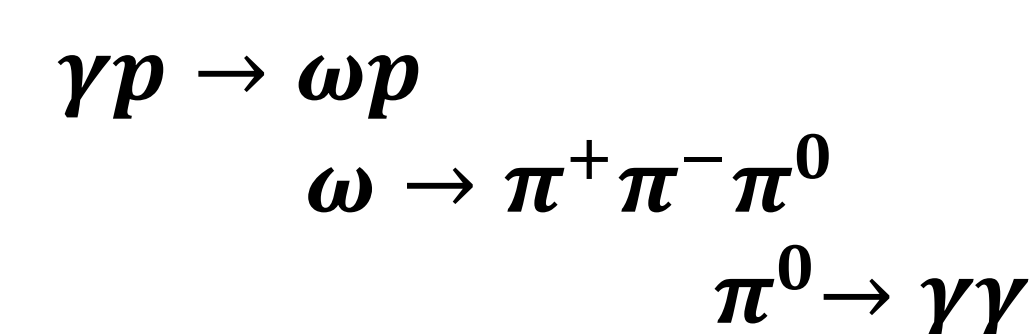
## Motivation

- Studying **light mesons** helps us understand how quarks interact through the strong force.
- The  **$\omega(782)$  meson** is abundantly produced in photon-proton interactions, making it well suited for experimental study.
- Yield extraction** is the first step toward detailed physics analyses such as angular distributions and Dalitz studies.

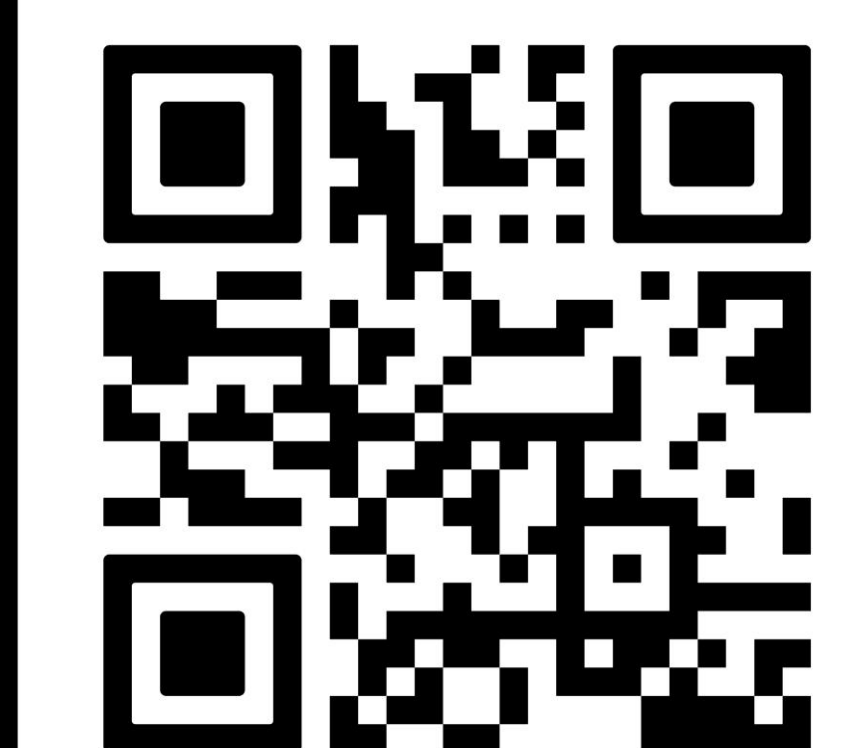
## Introduction

- The **GlueX experiment** at Jefferson searches for hybrid mesons and studies the light meson spectrum using a **linearly polarized photon beam** on a **liquid hydrogen target**.
- Photoproduction reactions produce large samples of light mesons.

This analysis focuses on the  **$\pi^+\pi^-\pi^0$  final state** to isolate the  **$\omega(782)$  meson**.



## References

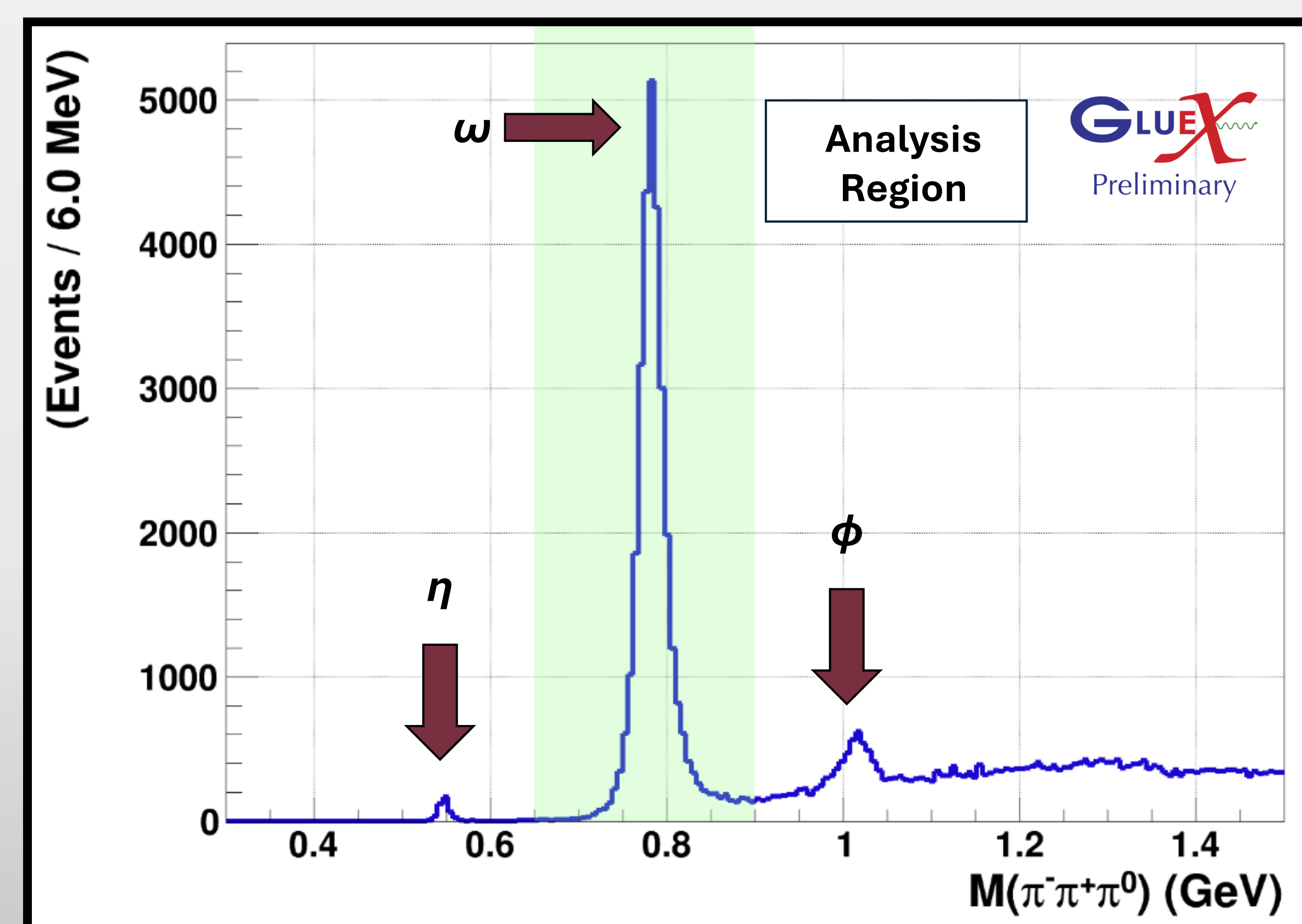


### Goal:

- Reconstruct  **$\omega$  candidates** using a data sample from GlueX.
- Apply event selections to improve **signal-to-background ratio**
- Extract  **$\omega$  signal yield**.

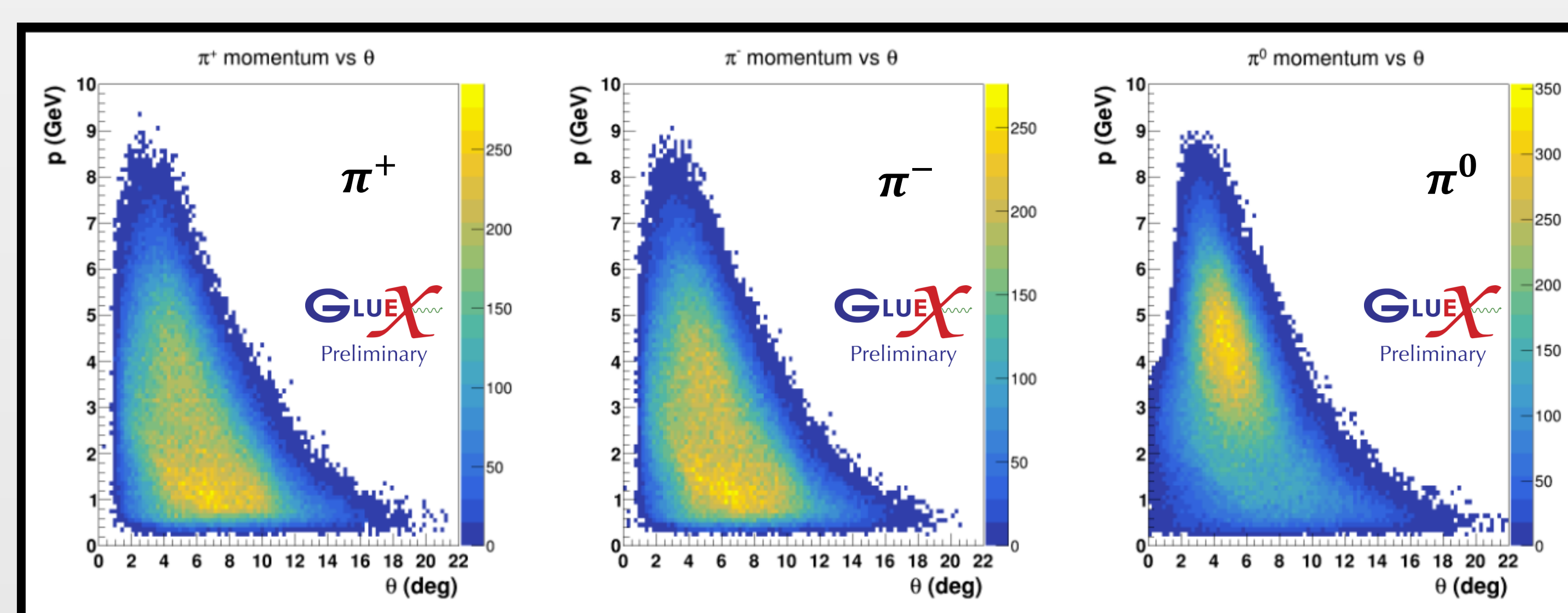
## Invariant Mass Plot

Invariant mass distribution of the **three-pion system**.

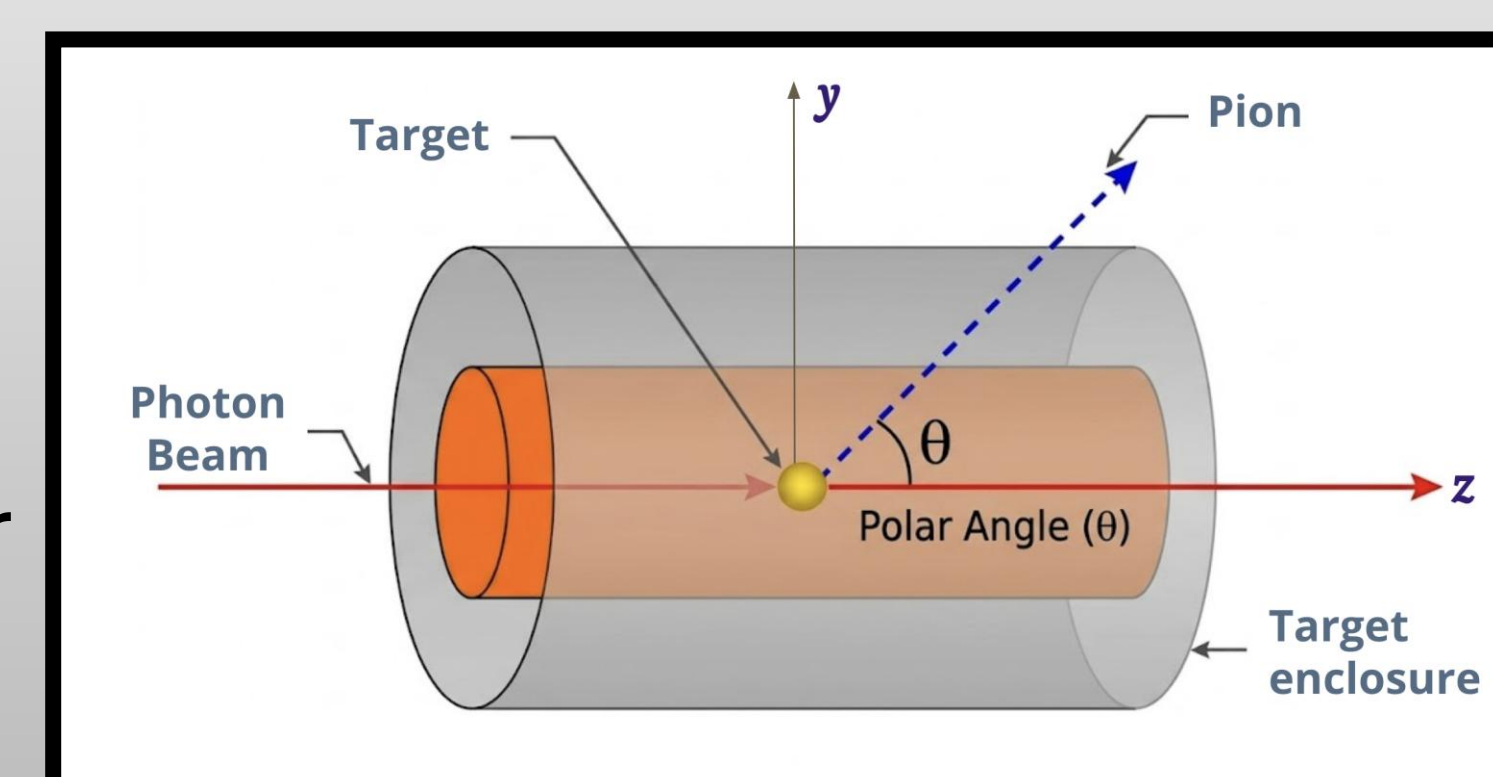


- Distinct peaks correspond to known resonances.
- The  **$\omega(782)$**  appears as a clear peak in the spectrum.
- Strategic selection cuts are applied to enhance the signal-to-background ratio.

## Momentum vs Angle Distributions

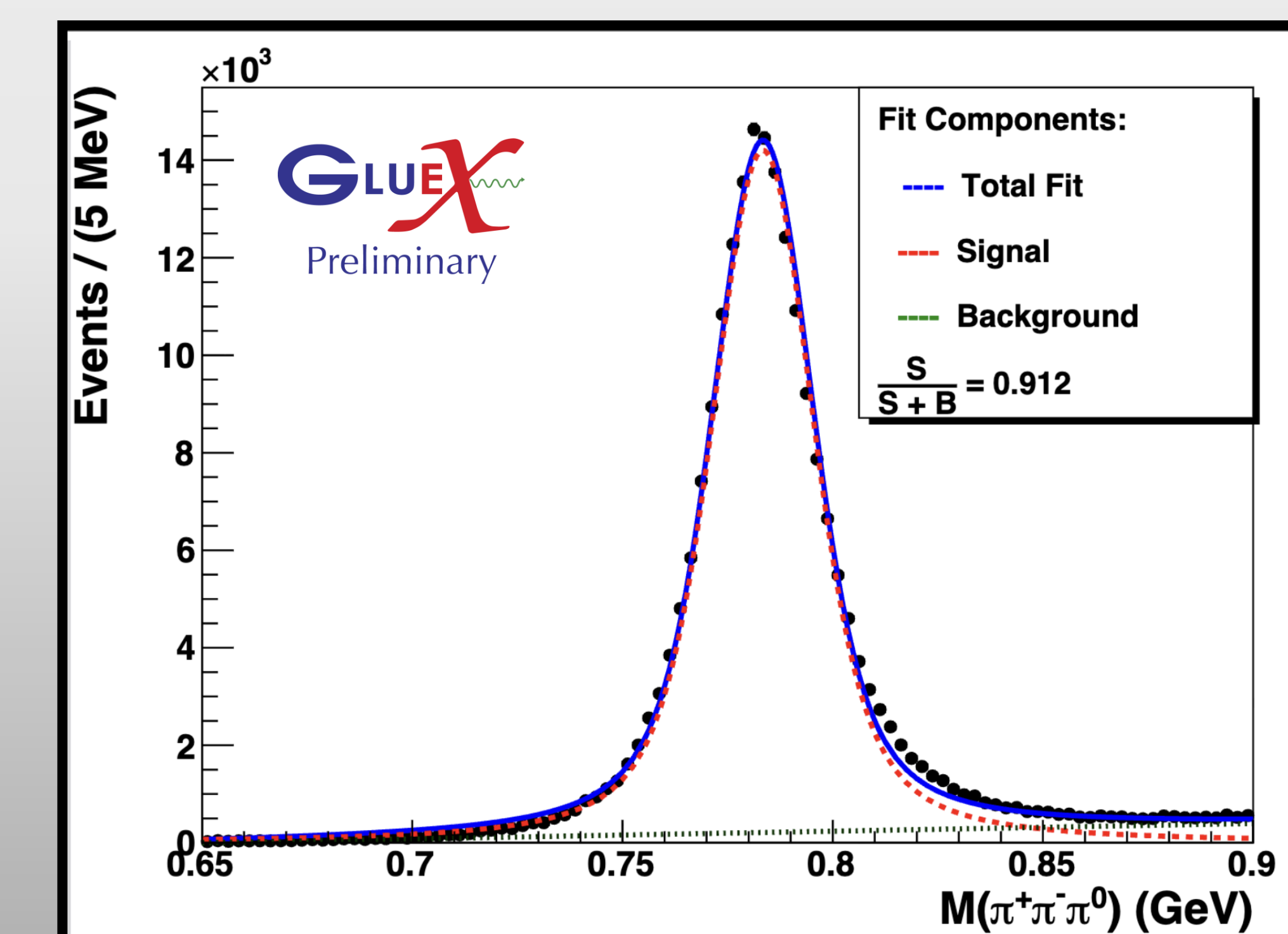


- These plots show how **the pions are distributed in the detector**.
- They help check detector coverage and see how **event selections affect the data** and pion kinematics.



## Yield Extraction Result

- Modeled **signal (S)** with Voigtian and **background (B)** using a polynomial function to fit the  $\pi^+\pi^-\pi^0$  invariant mass.
- Extracted the **no. of reconstructed  $\omega \rightarrow 3\pi$  events**.



## Summary

- Reconstructed  **$\pi^+\pi^-\pi^0$  final state** to isolate the  **$\omega(782)$** .
- ~ 90% signal purity** after selections.
- Extracted  **$\omega$  signal yields** using invariant mass fits.

## Future Goals

- Extend this yield extraction process to compare the  **$\omega$  meson yields across different data runs**.
- These yields provide a **baseline for further  $\omega$  physics studies** by incorporating more sophisticated data analysis techniques which we will explore.

## Acknowledgement

Many thanks to my mentor Saheli Rakshit for her guidance and support with this project. Her patience and dedication on teaching me the basics of code and physics analysis will be forever appreciated.

The group at Florida State University acknowledges support from the U.S. Department of Energy, Office of Science, Office of Nuclear Physics, under Contract No. DE-FG02-92ER40735.

GlueX acknowledgements:  
<http://gluex.org/thanks>