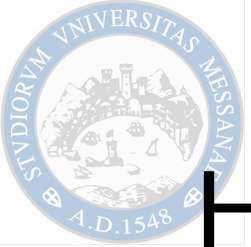




# Hadron Spectroscopy at CLAS12

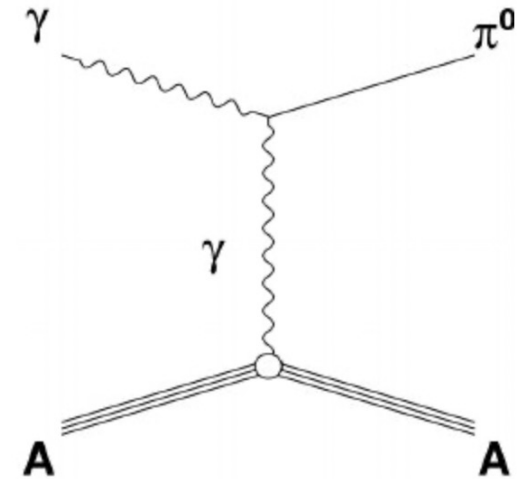
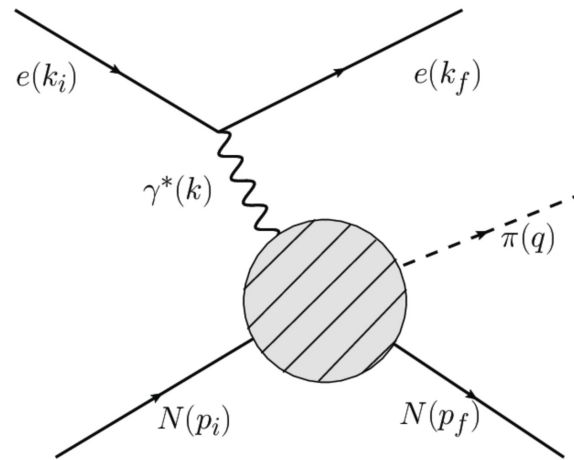
Marco Filippini  
University of Messina



# Hadron Spectroscopy

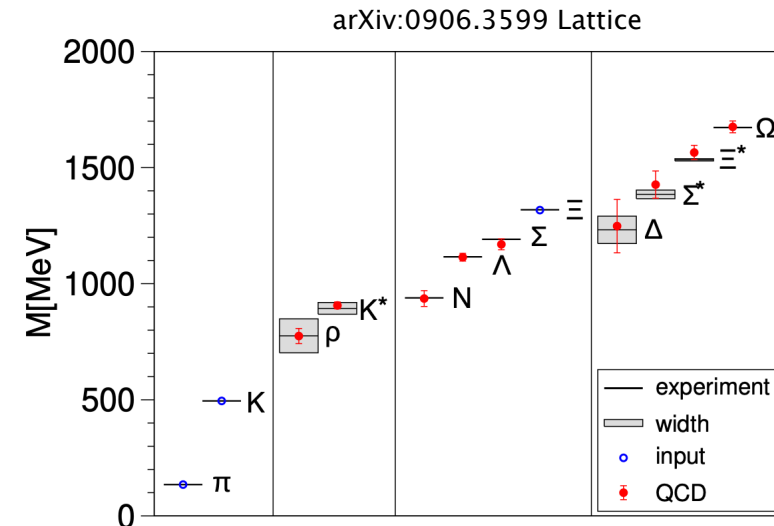
Necessary for understanding:

- QCD
- Quark confinement
- Looking for new particles (exotics)
- Nature of mass



The better way is using electromagnetic interactions:

- Photoproduction
- Electroproduction





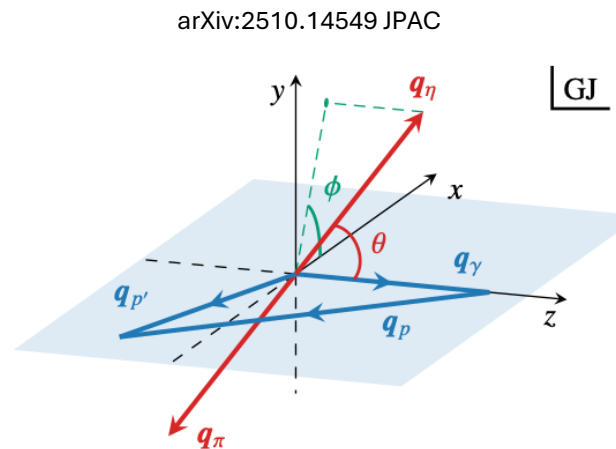
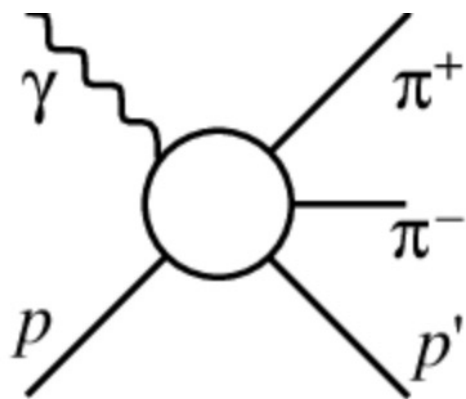
# Meson Spectroscopy

Why focus on meson production:

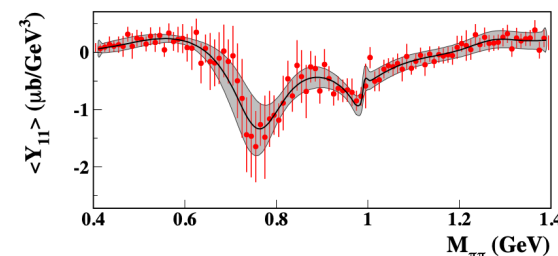
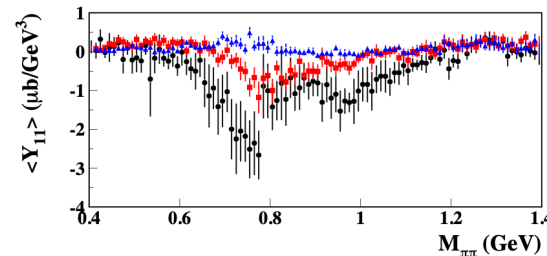
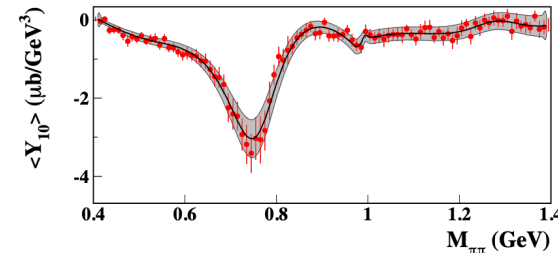
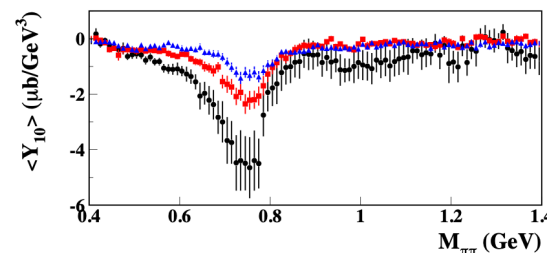
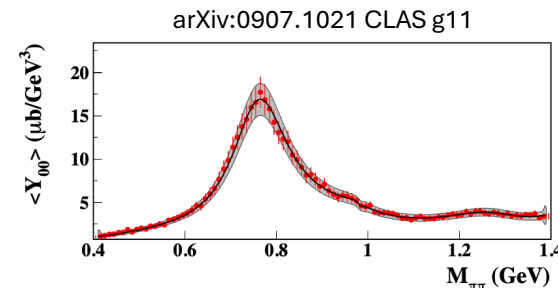
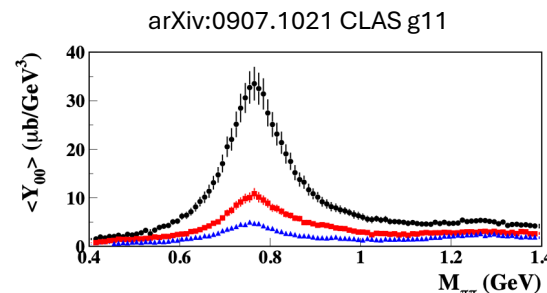
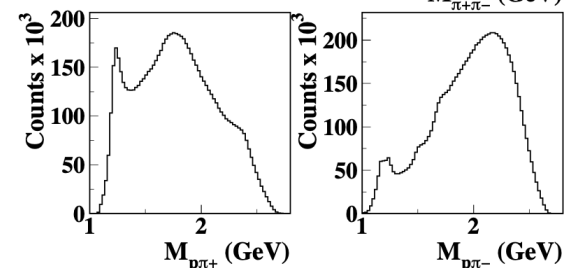
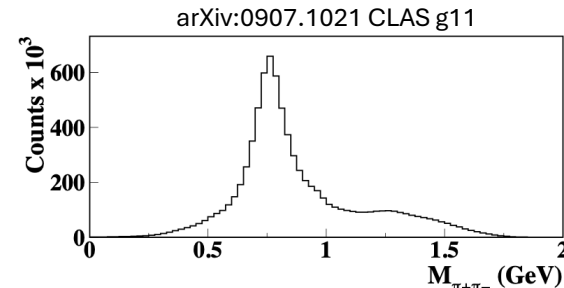
- Looking for known ordinary resonances
- Determine production mechanism
  - old results from CLAS g11 for 3-3.8 GeV

Analysis of channel  $\gamma^* p \rightarrow p \pi^+ \pi^-$

Possible goal is extracting production cross section for  $f_2$



arXiv:2510.14549 JPAC

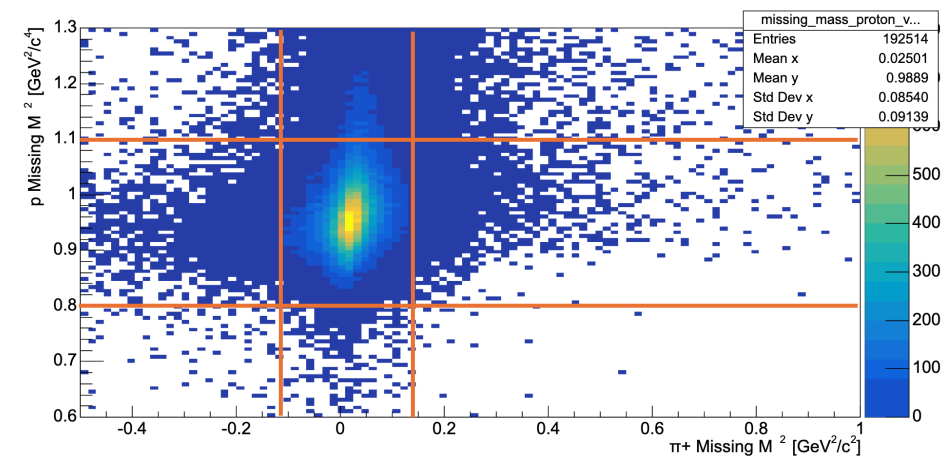
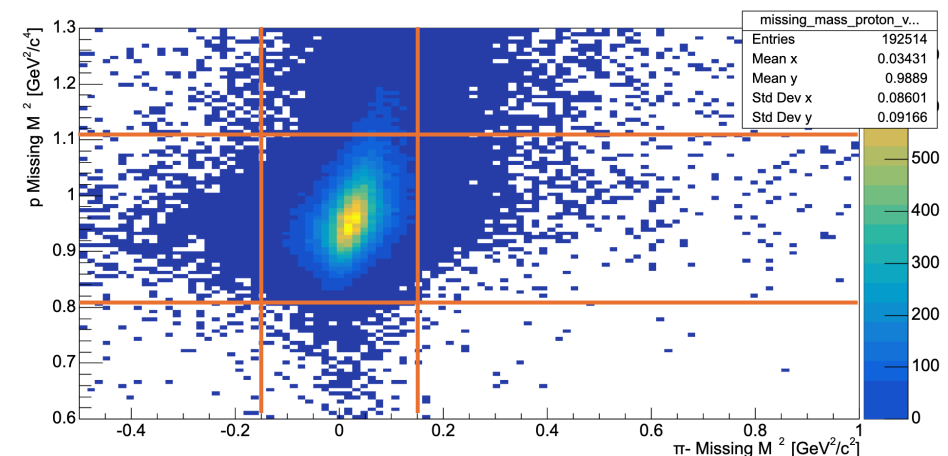
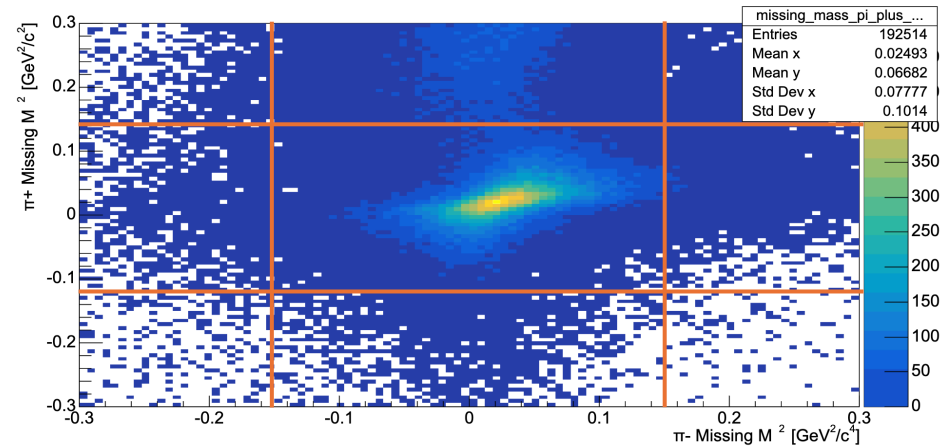
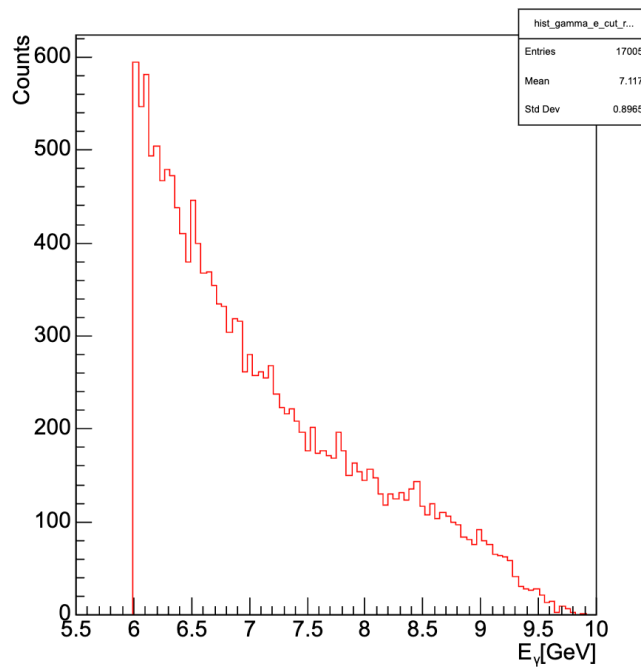
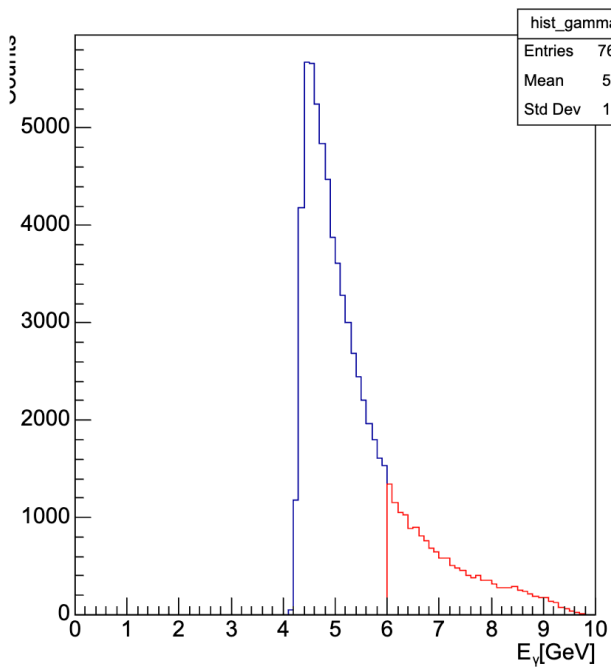




# MC Analysis

Setting cuts on exclusivity variables and gamma energy:

- $0.8 < p \text{ missing mass} < 1.1$
- $-0.15 < \pi^- \text{ missing mass} < 0.15$
- $-0.12 < \pi^+ \text{ missing mass} < 0.14$
- $E_\gamma > 6 \text{ GeV}$

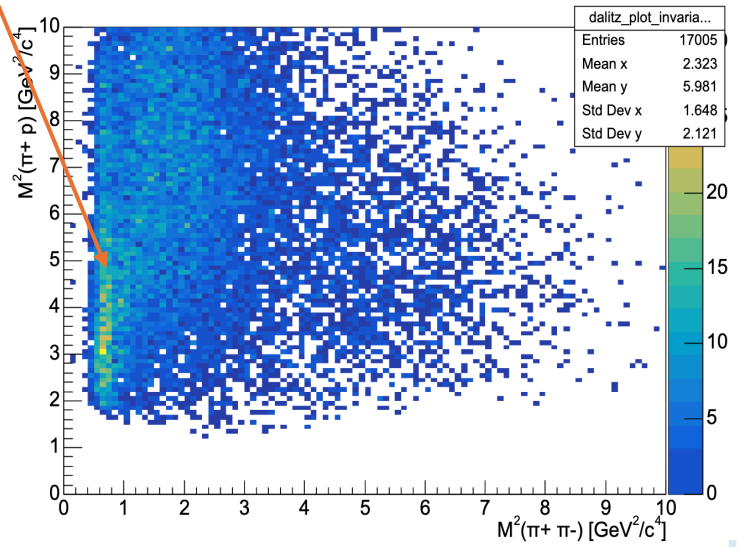
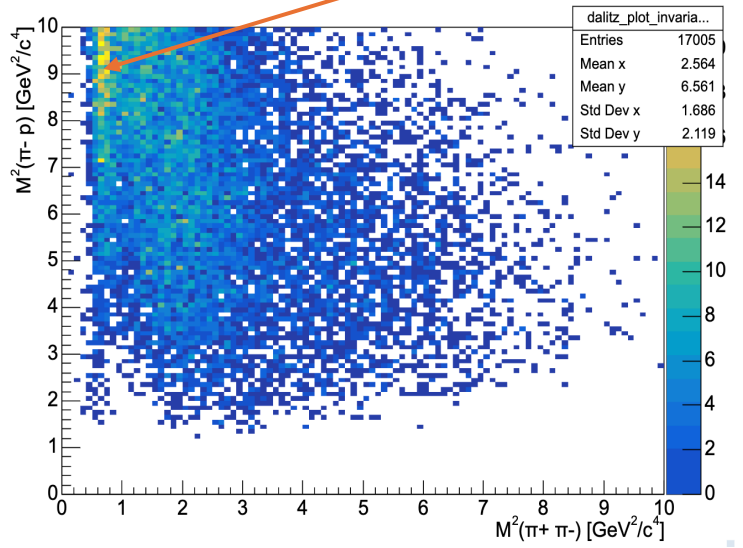




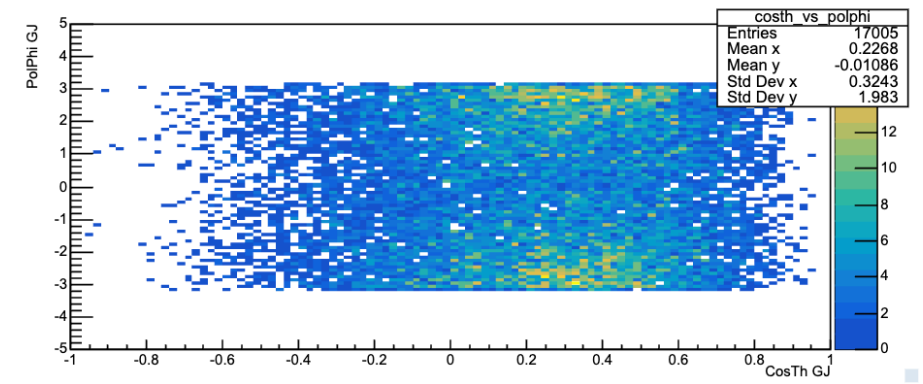
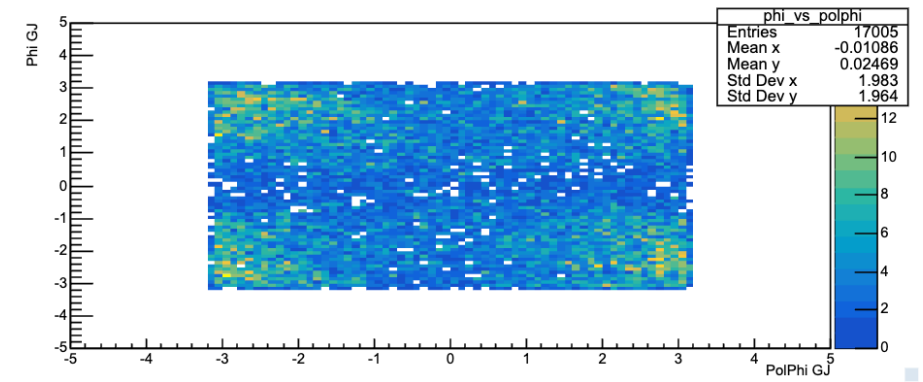
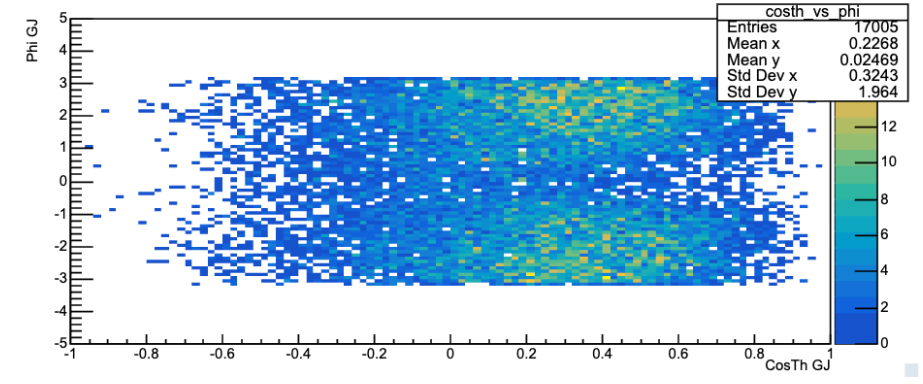
# MC Analysis

Looking for resonances

$\rho^0$



GJ angles relations

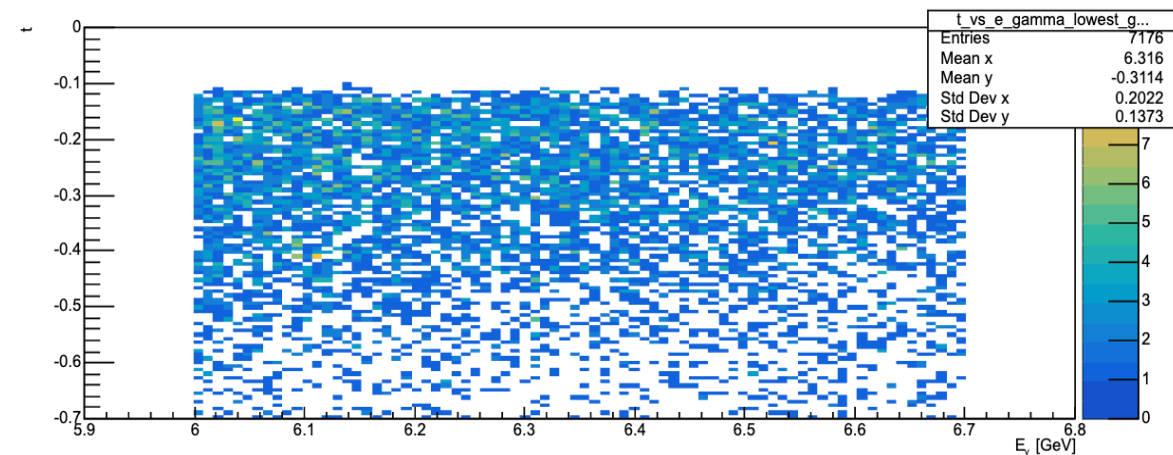
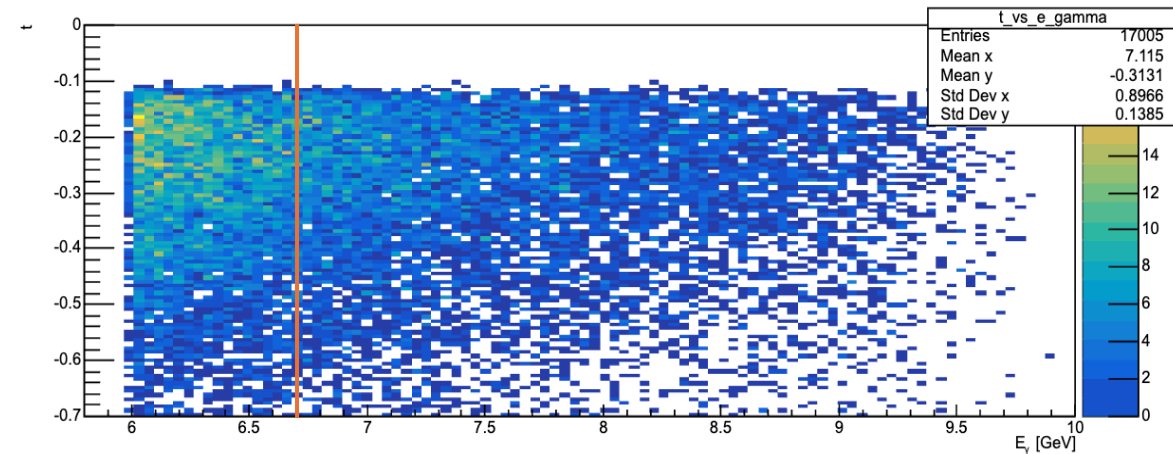
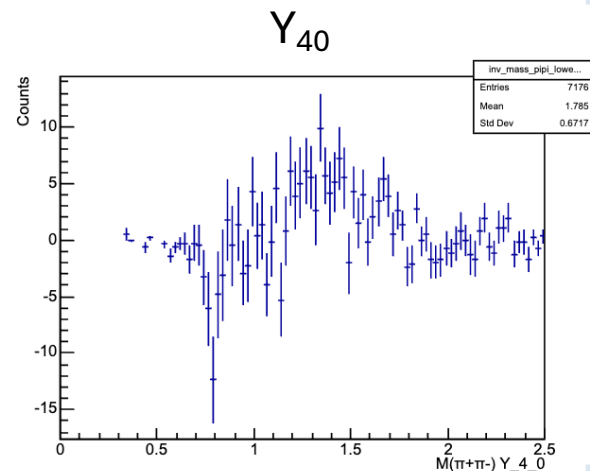
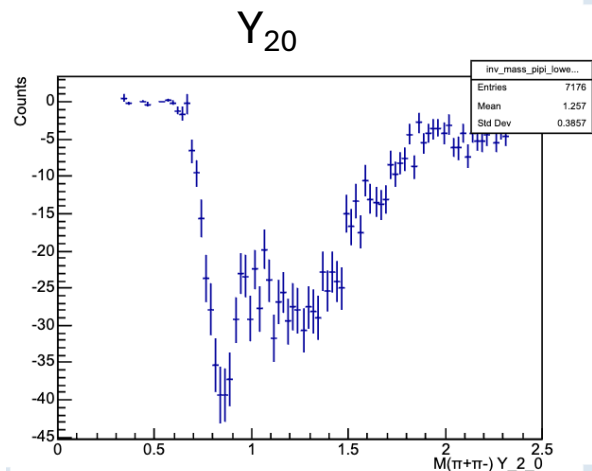
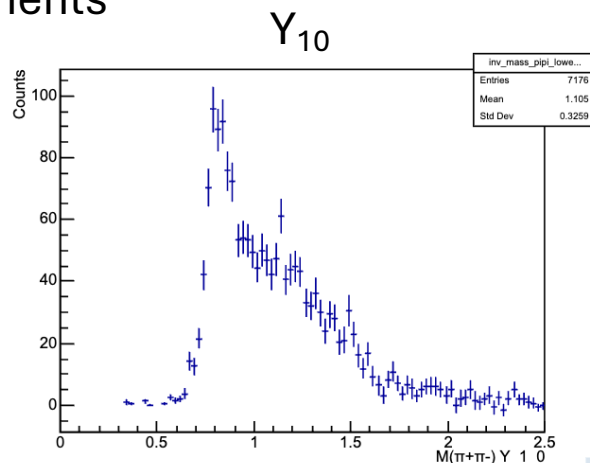
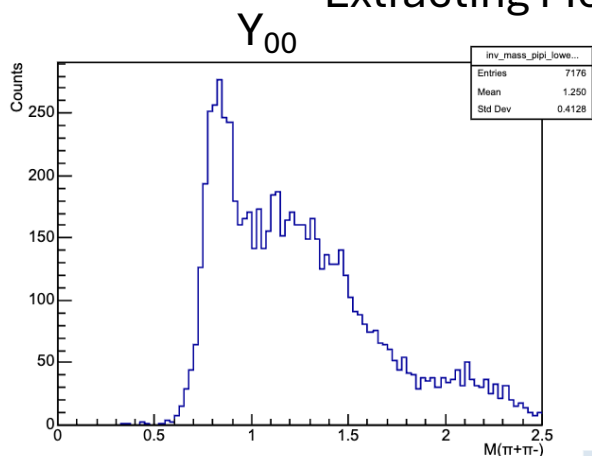


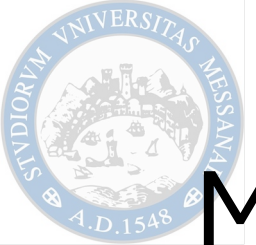


# MC Analysis

Analysing the gamma energy region 6-6.7 GeV

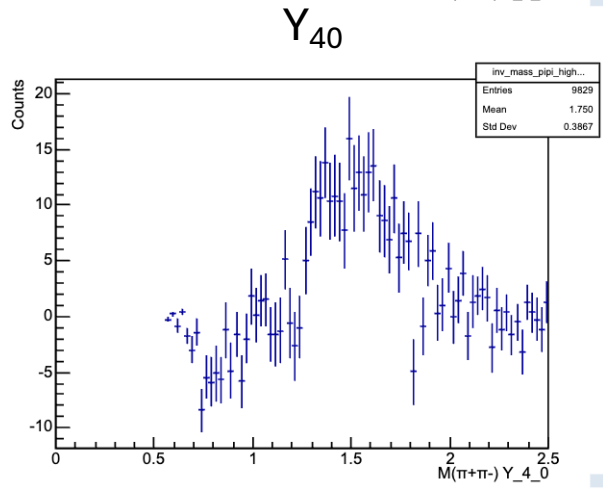
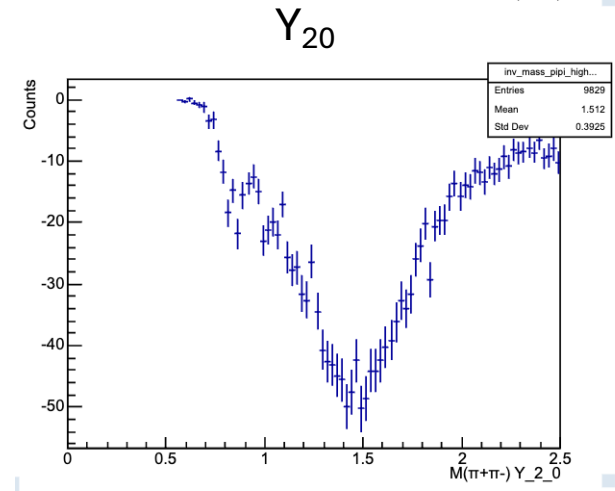
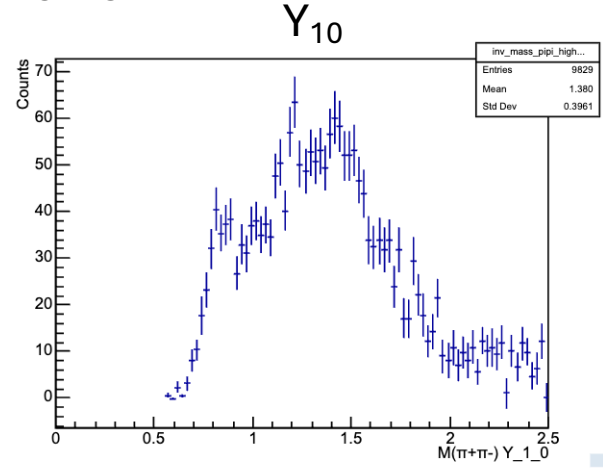
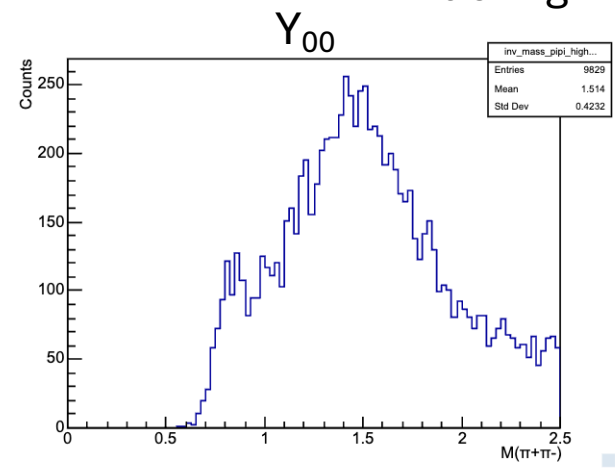
Extracting Moments



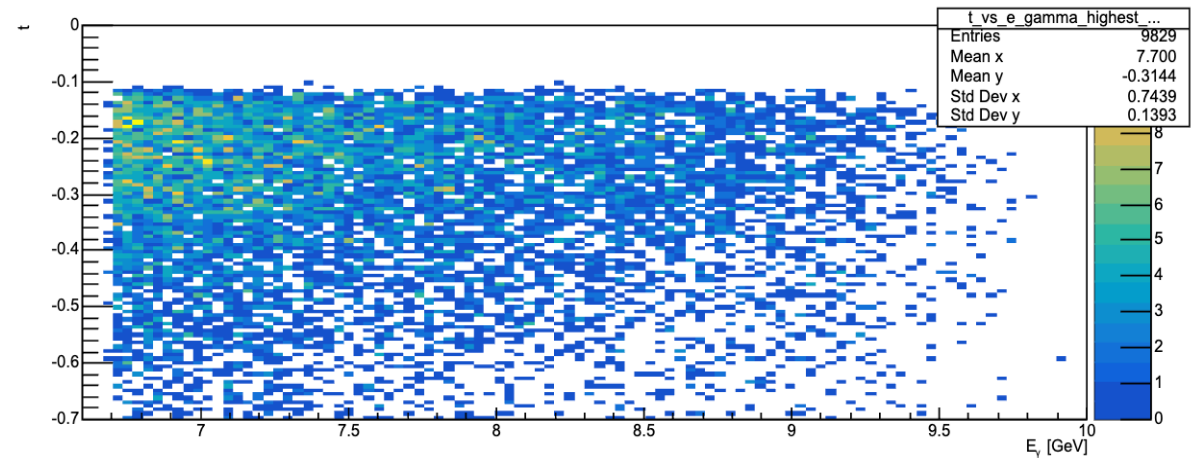
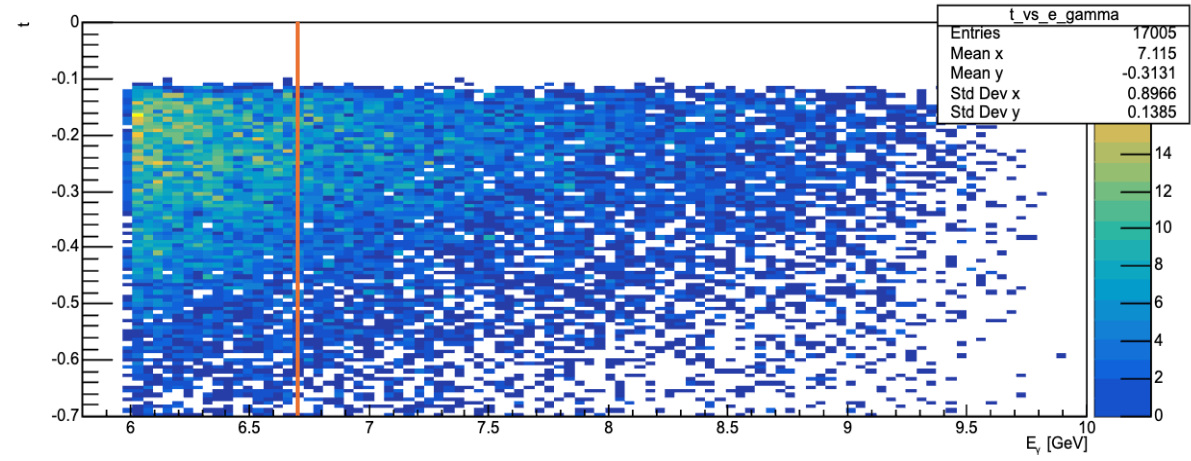


# MC Analysis

## Extracting Moments



## Analysing the gamma energy region > 6.7 GeV

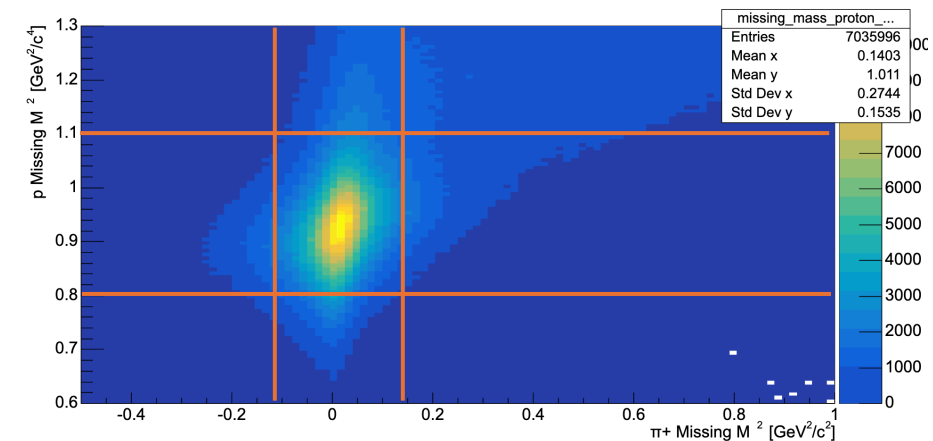
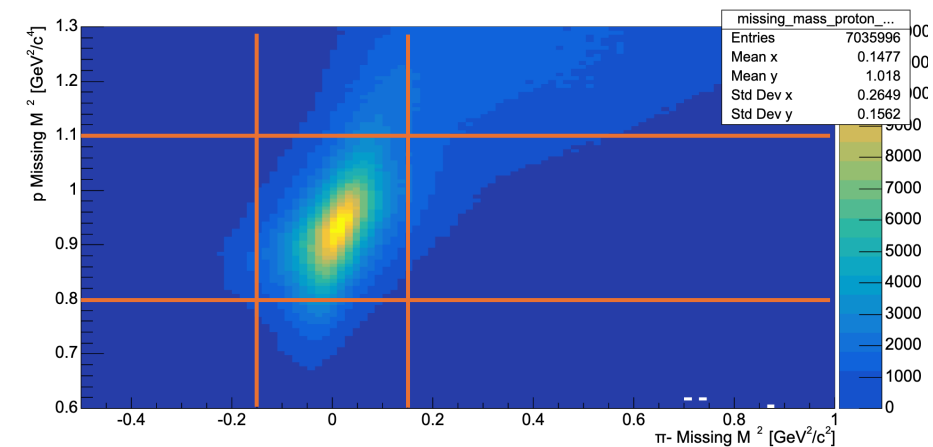
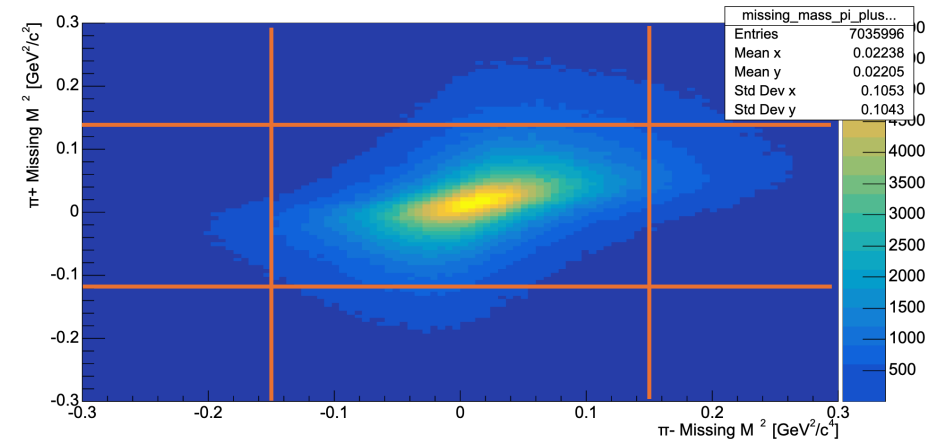
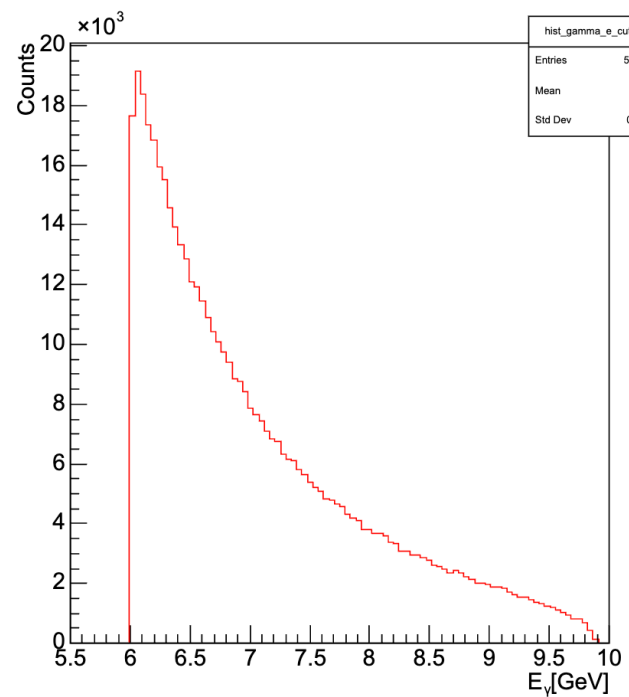
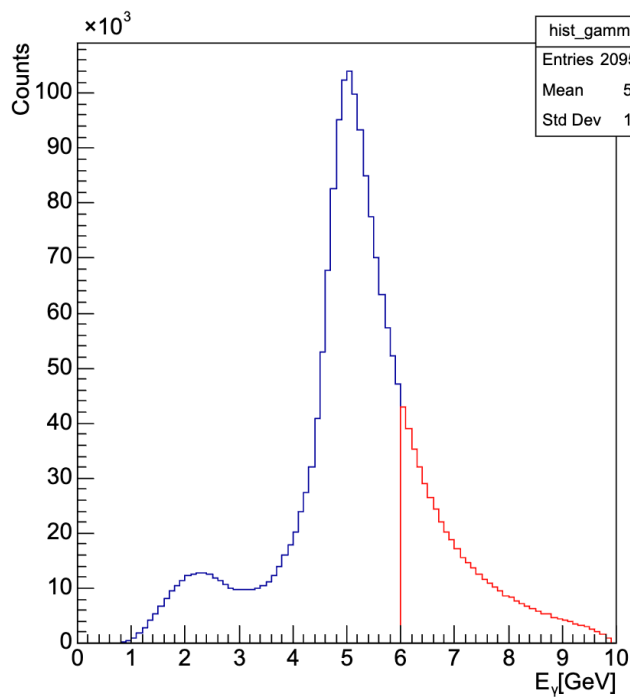




# Data Analysis

Setting same cuts of MC analysis:

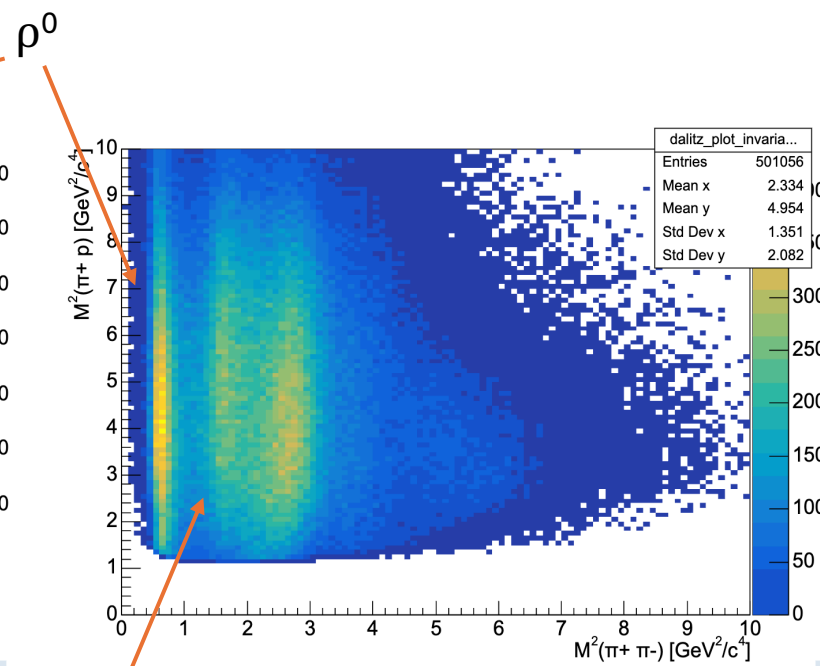
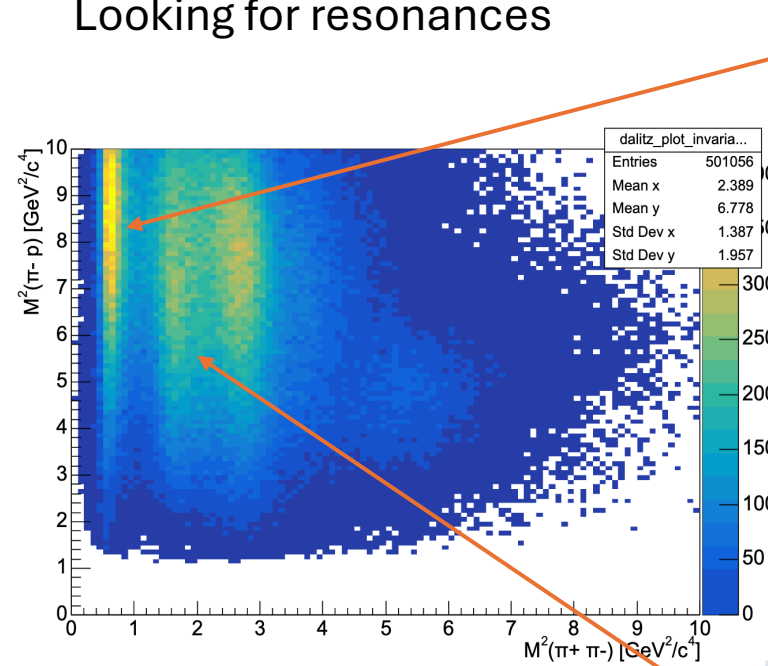
- $0.8 < p \text{ missing mass} < 1.1$
- $-0.15 < \pi^- \text{ missing mass} < 0.15$
- $-0.12 < \pi^+ \text{ missing mass} < 0.14$
- $E_\gamma > 6 \text{ GeV}$





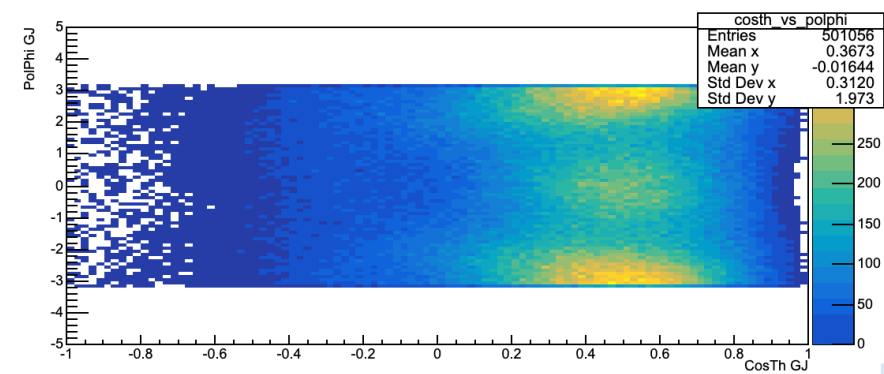
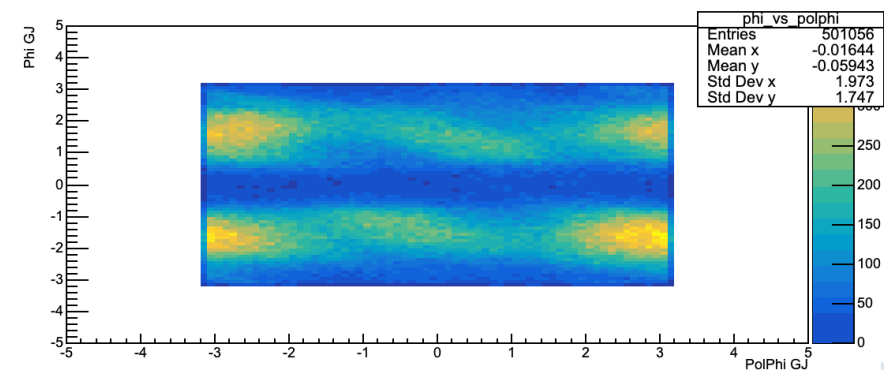
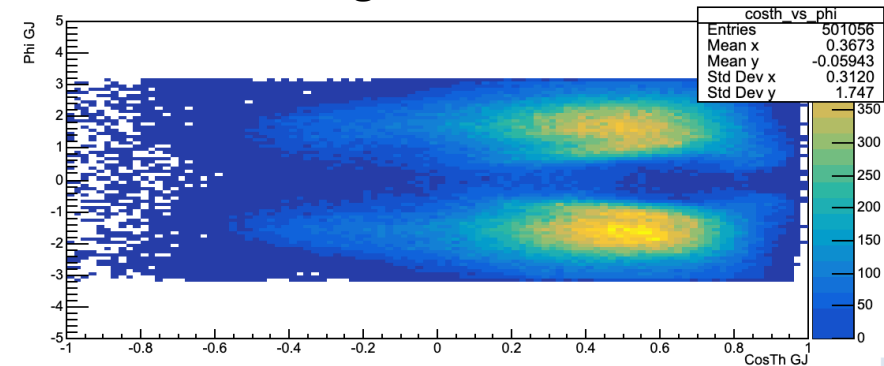
# Data Analysis

Looking for resonances



$f_2(1270)$

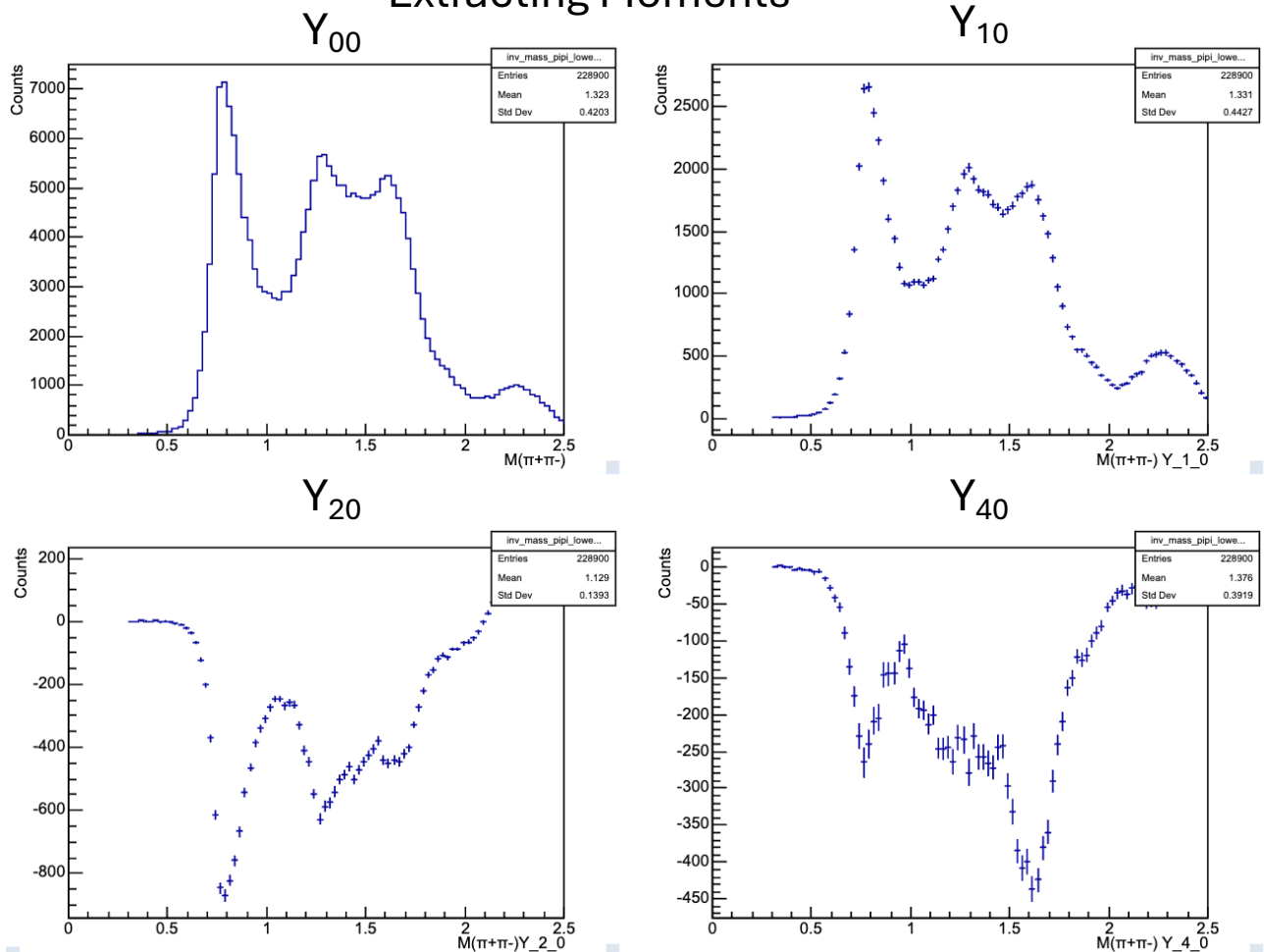
GJ angles relations



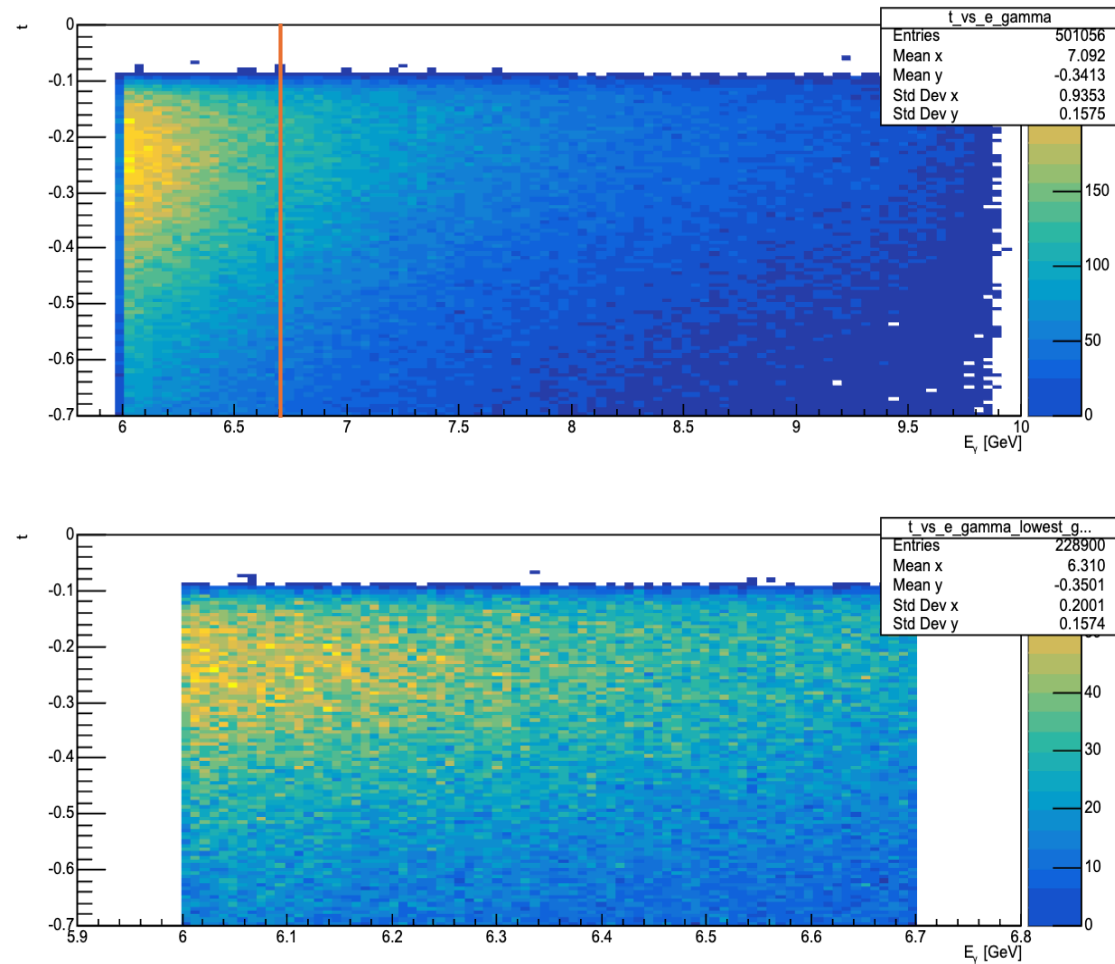


# Data Analysis

## Extracting Moments



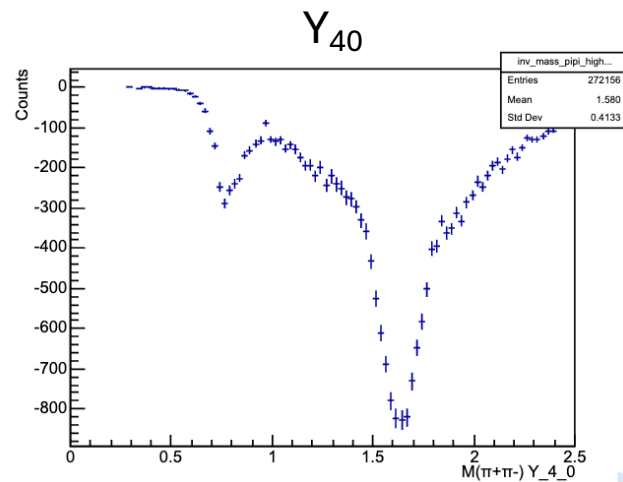
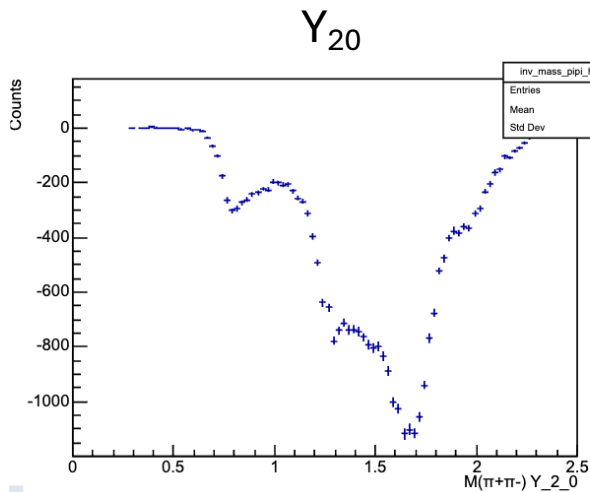
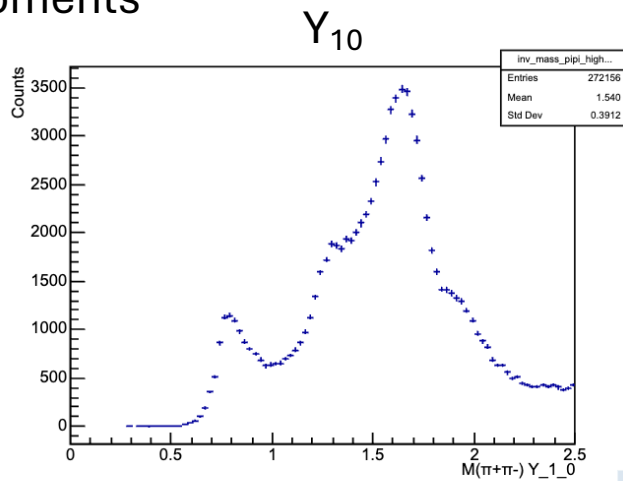
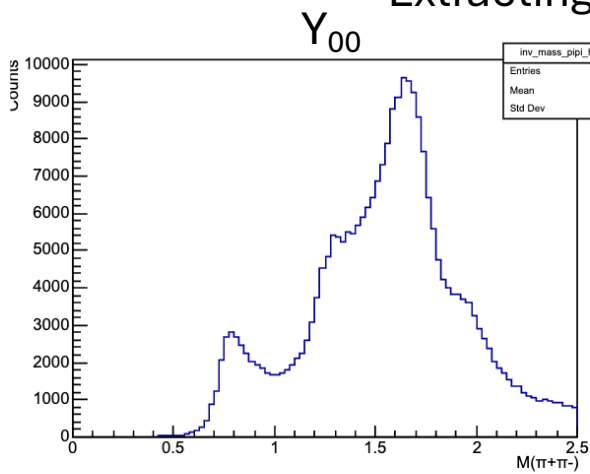
## Analysing the gamma energy region 6-6.7 GeV



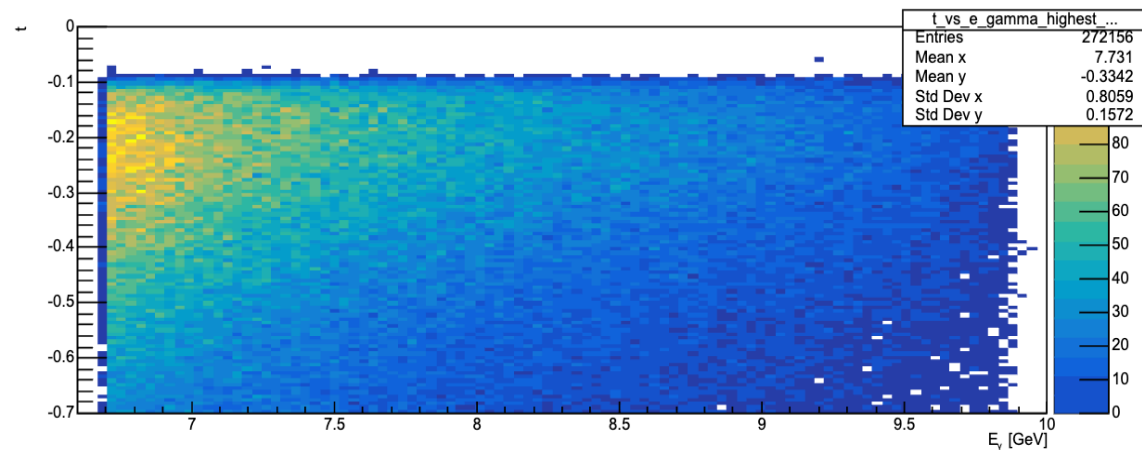
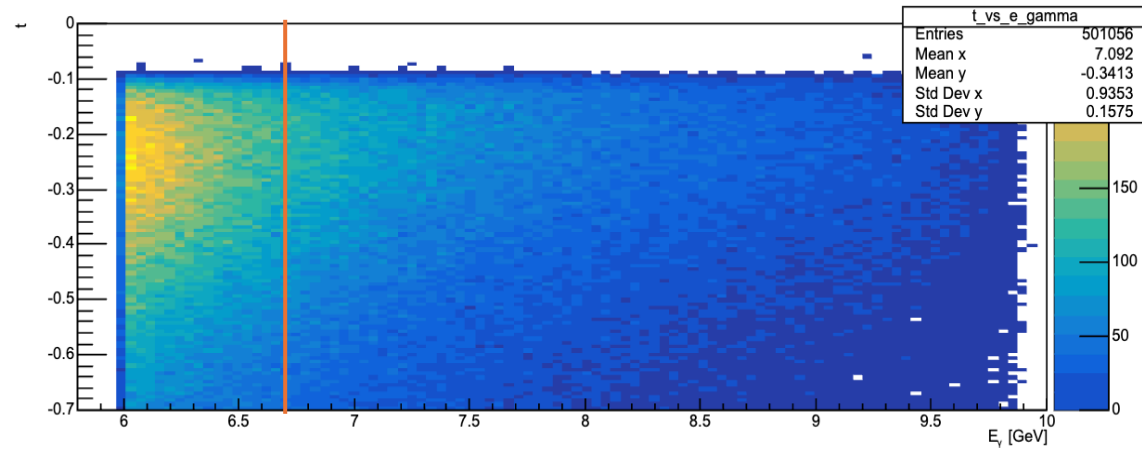


# Data Analysis

### Extracting Moments



### Analysing the gamma energy region > 6.7 GeV





# Summary

CLAS12 analysis on  $\gamma^* p \rightarrow p \pi^+ \pi^-$

Looking for known meson resonances

Possible goal: production of  $f_2$

## Next Steps

Fitting moments (work in progress...)



**THANKS FOR YOUR ATTENTION**