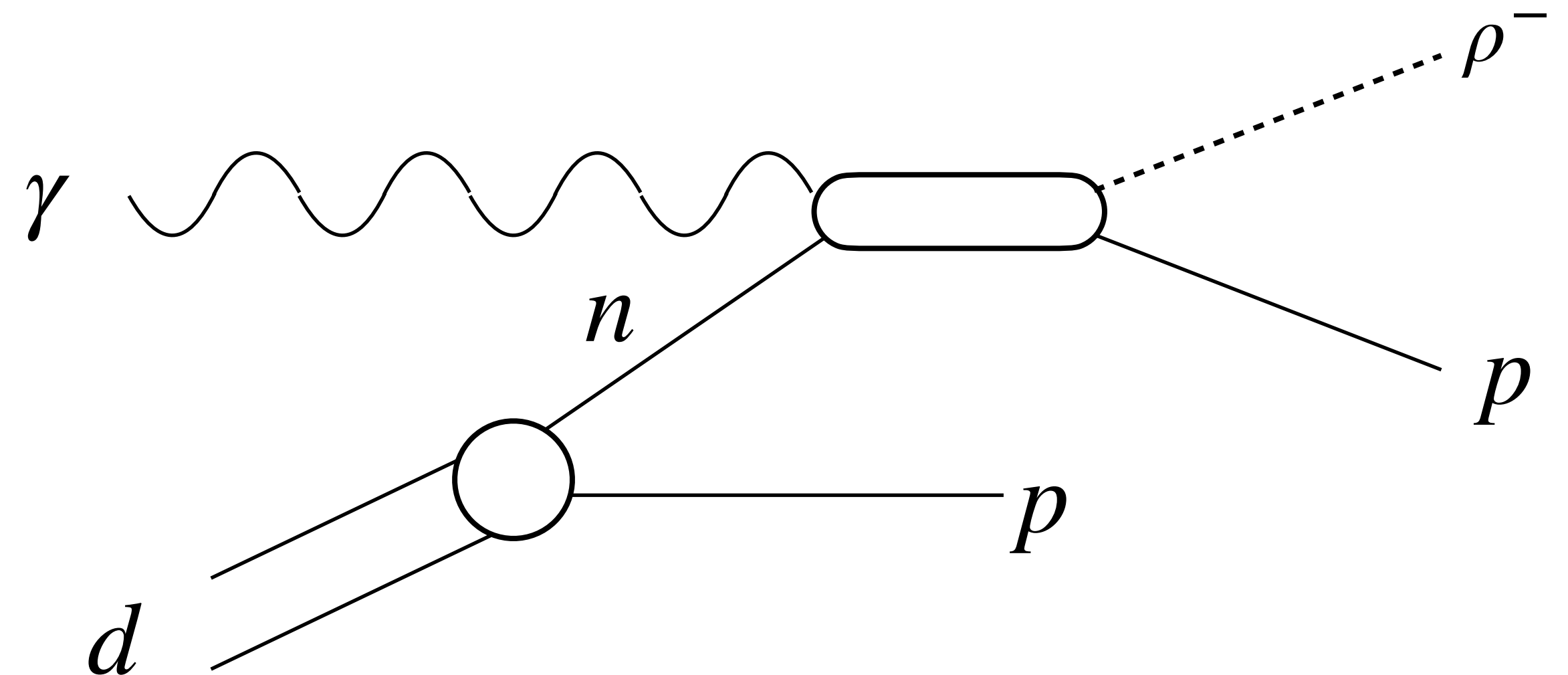


$\gamma n \rightarrow \rho^- p$ Cross Section
Extraction

Jackson Pybus

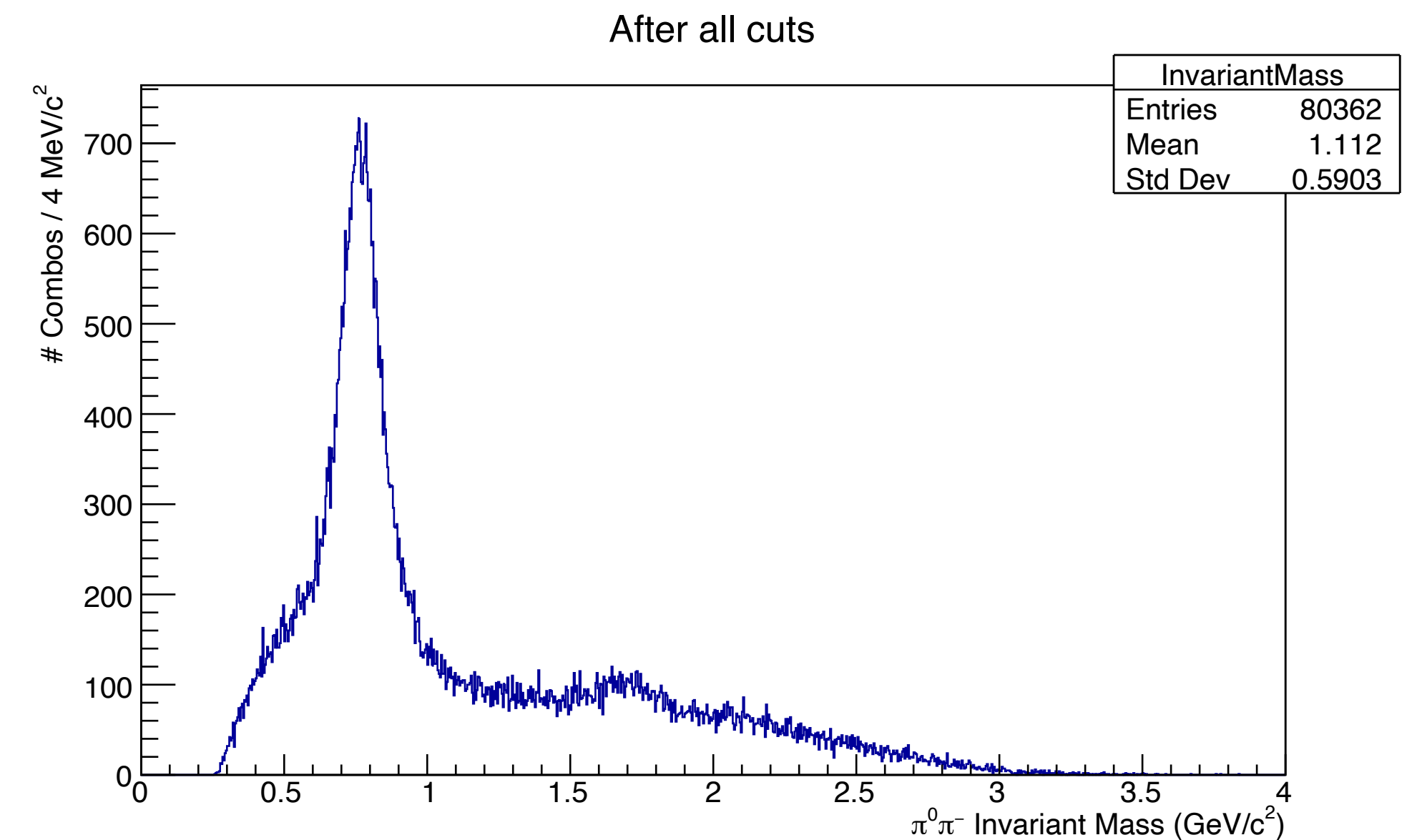
Measured Reaction

- Measurement channel: $\gamma d \rightarrow \pi^- \pi^0 p(p)$
- Using ReactionFilter plugin to specify final-state
- Final state of 1 proton, 1 π^- , 2 γ
- Constraints:
 - Common Vertex
 - $m_{\gamma\gamma} = m_{\pi^0}$
 - $m_{miss}^2 = m_p^2$
- (Missing proton because low-momentum protons are not detected)

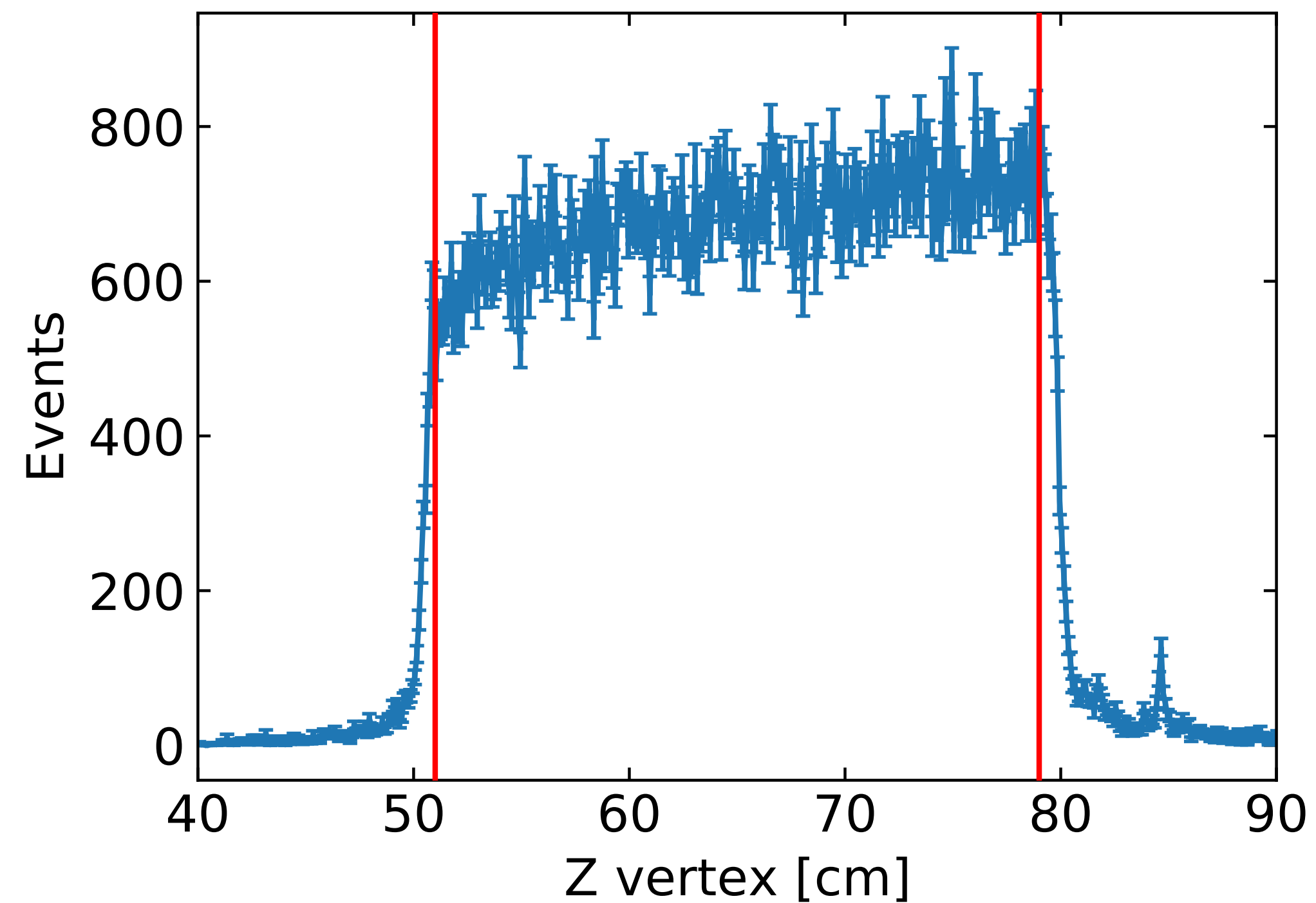
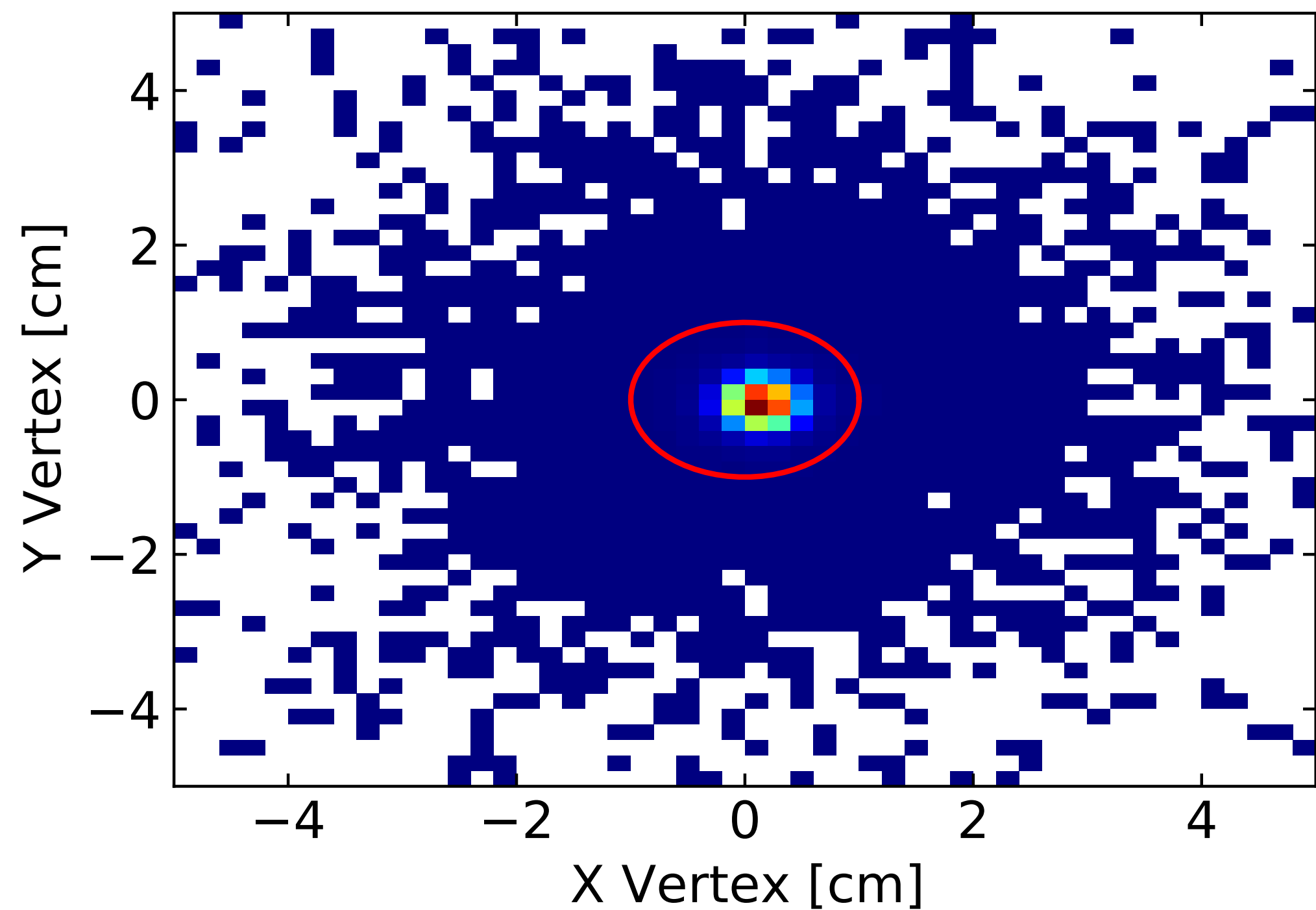


Event Selection

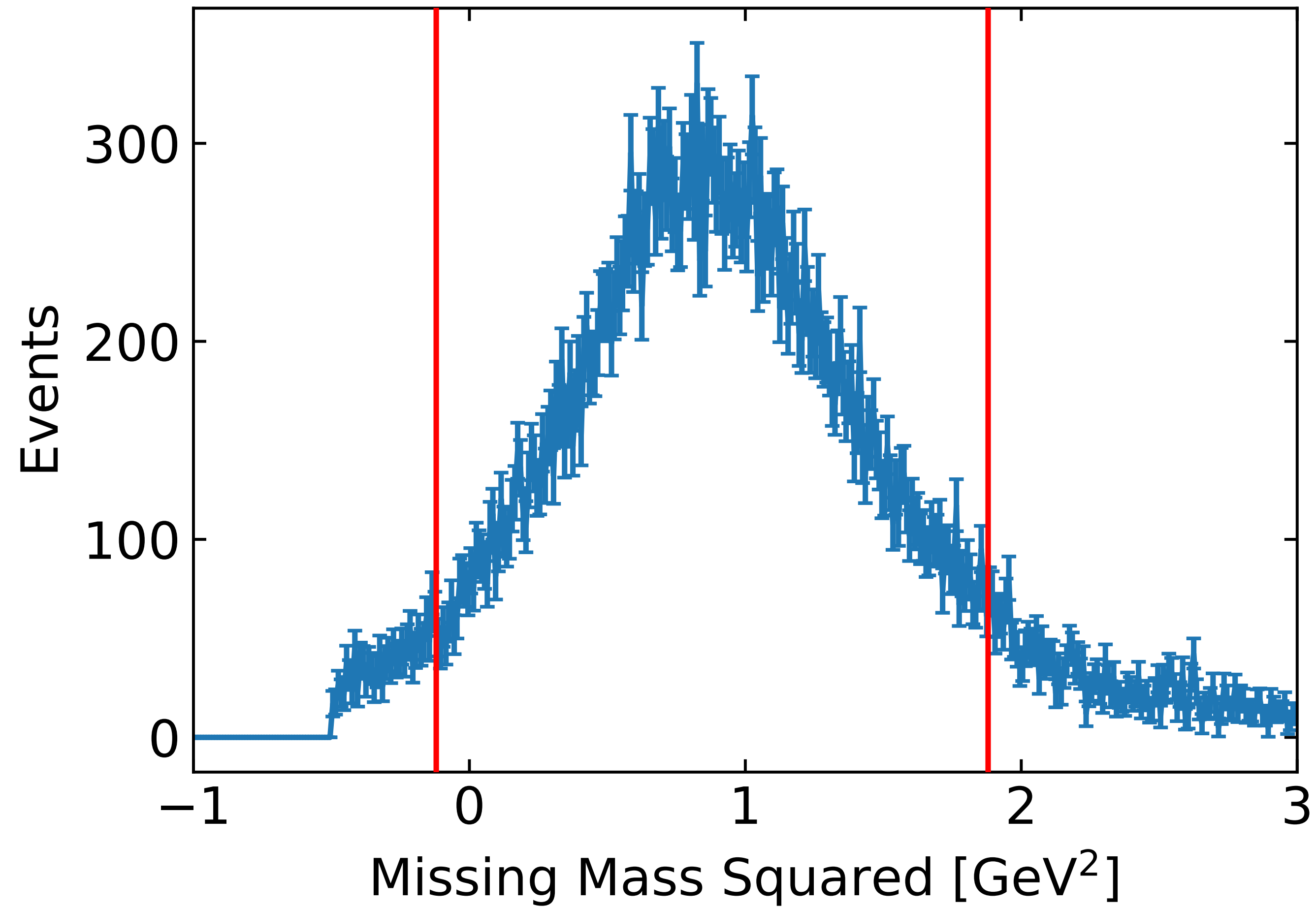
- Basic selection cuts applied in the Selector class
 - 0 unused charged tracks
 - 0 unused shower energy
 - PID CL > 0.1 for all particles
 - KinFit CL > 0.01 for the event
 - FCAL shower quality > 0.5
 - $6 < \text{Beam Energy} < 10.8 \text{ GeV}$
- Later cuts applied in separate ROOT script



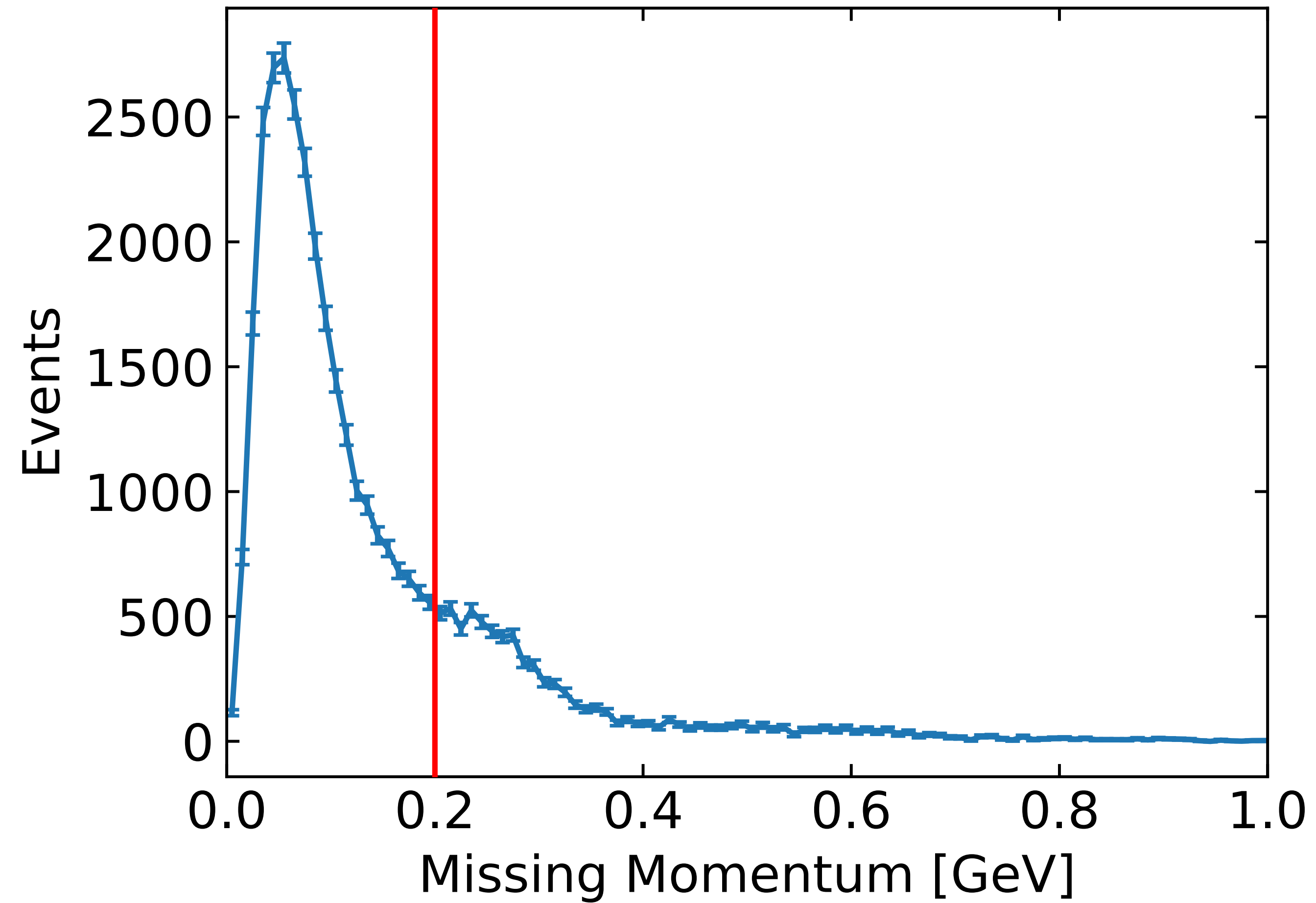
Vertex Cuts



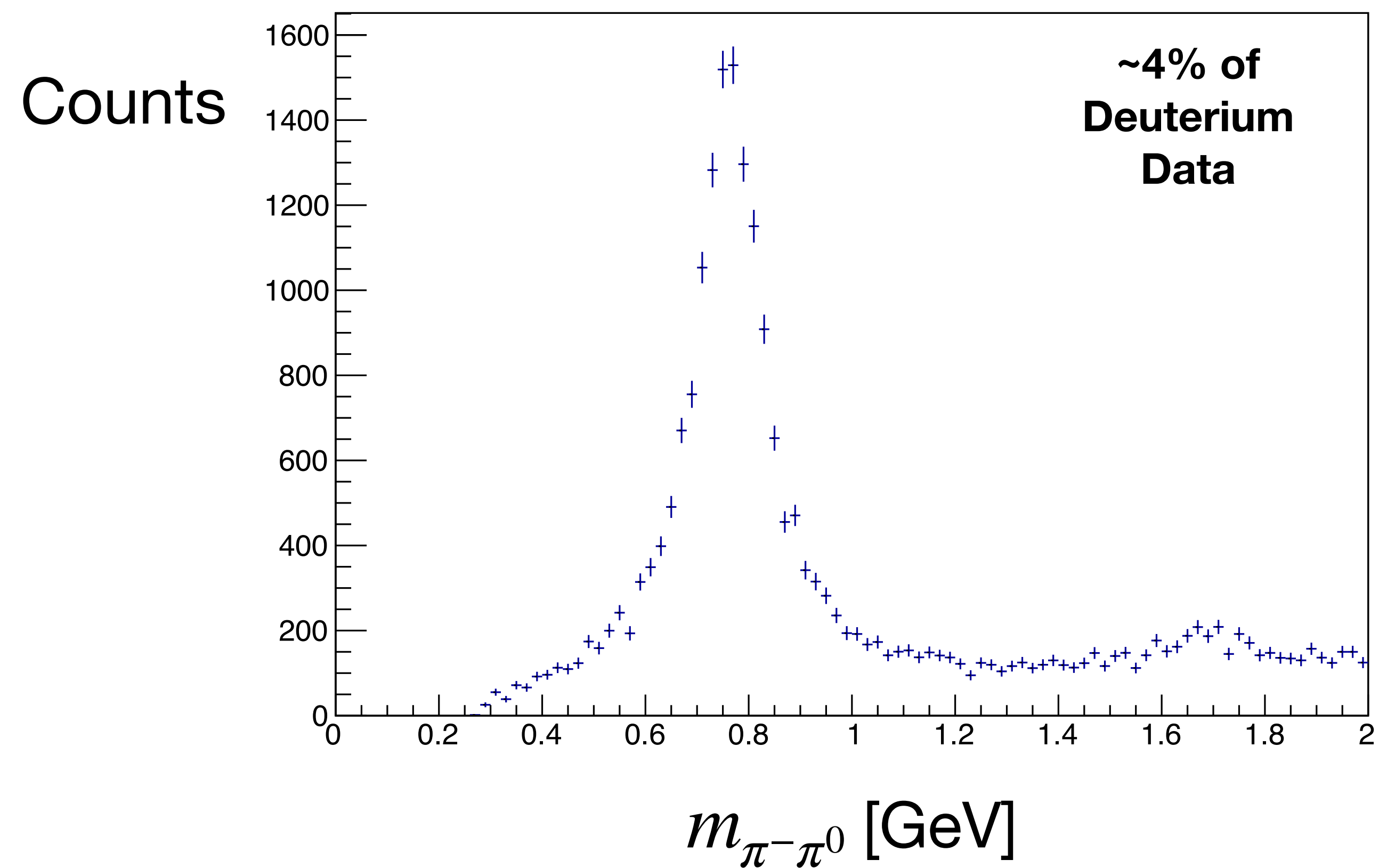
Measured Missing Mass $\sim m_p$



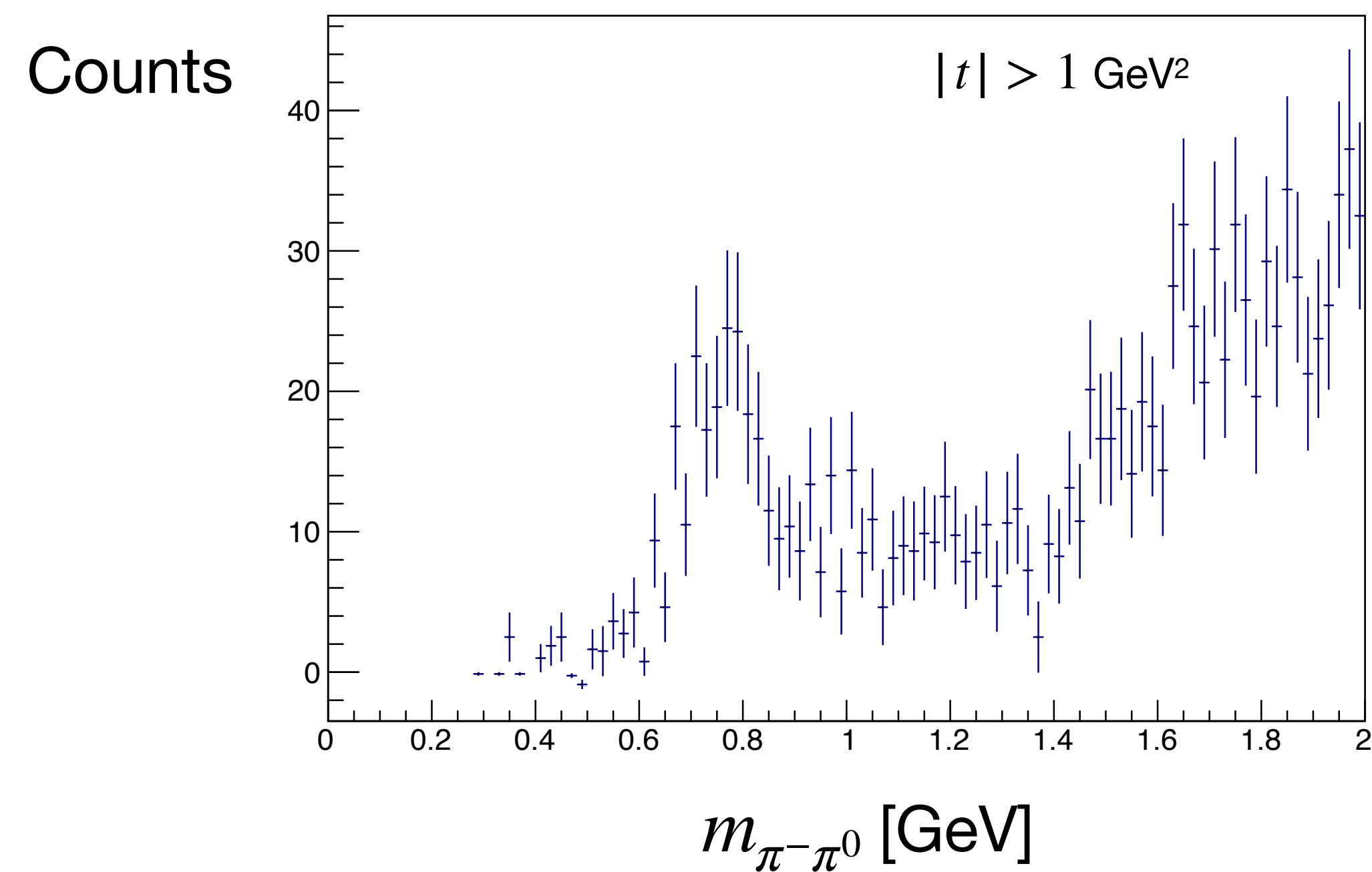
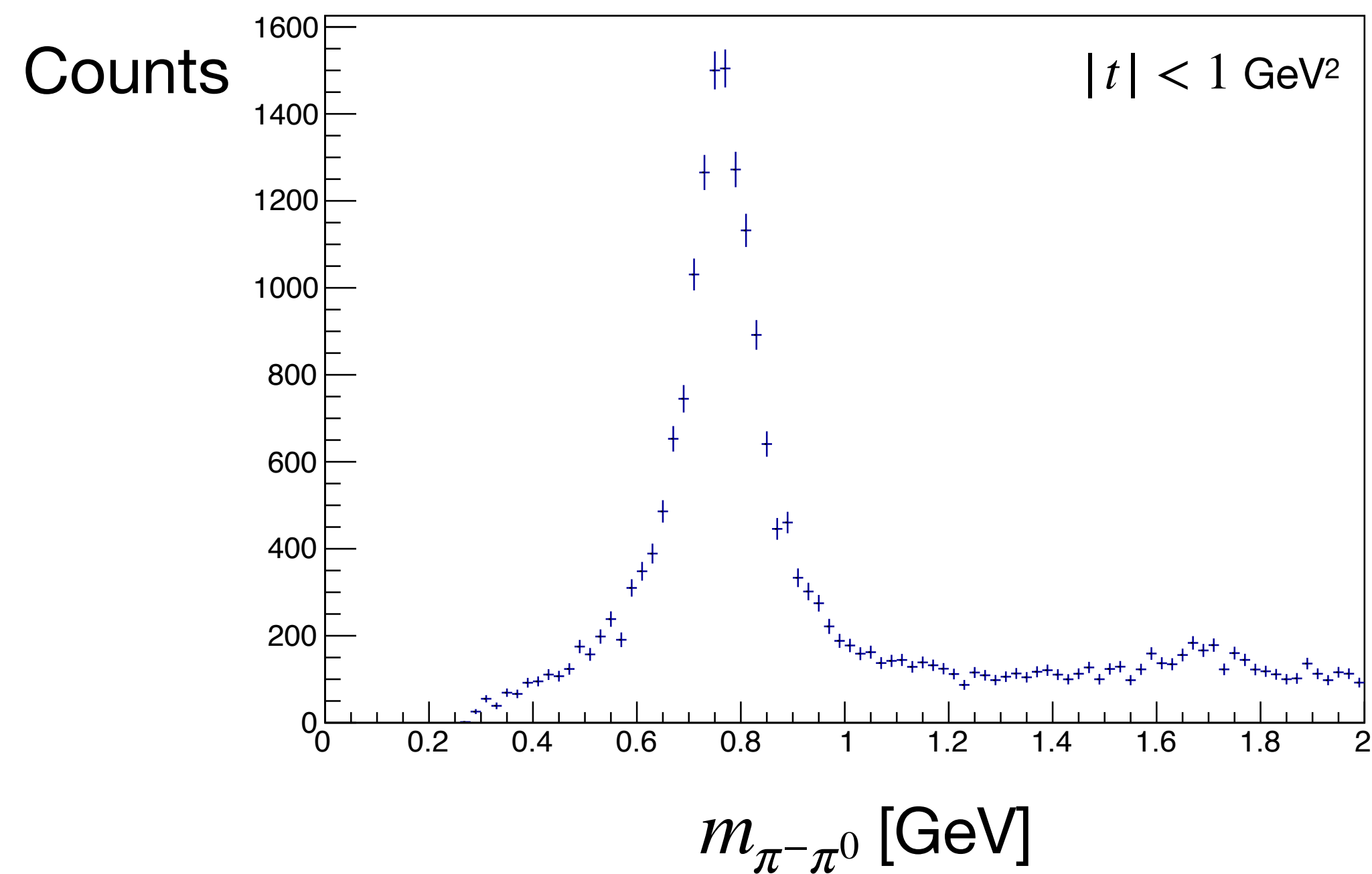
Fit Missing Momentum Low



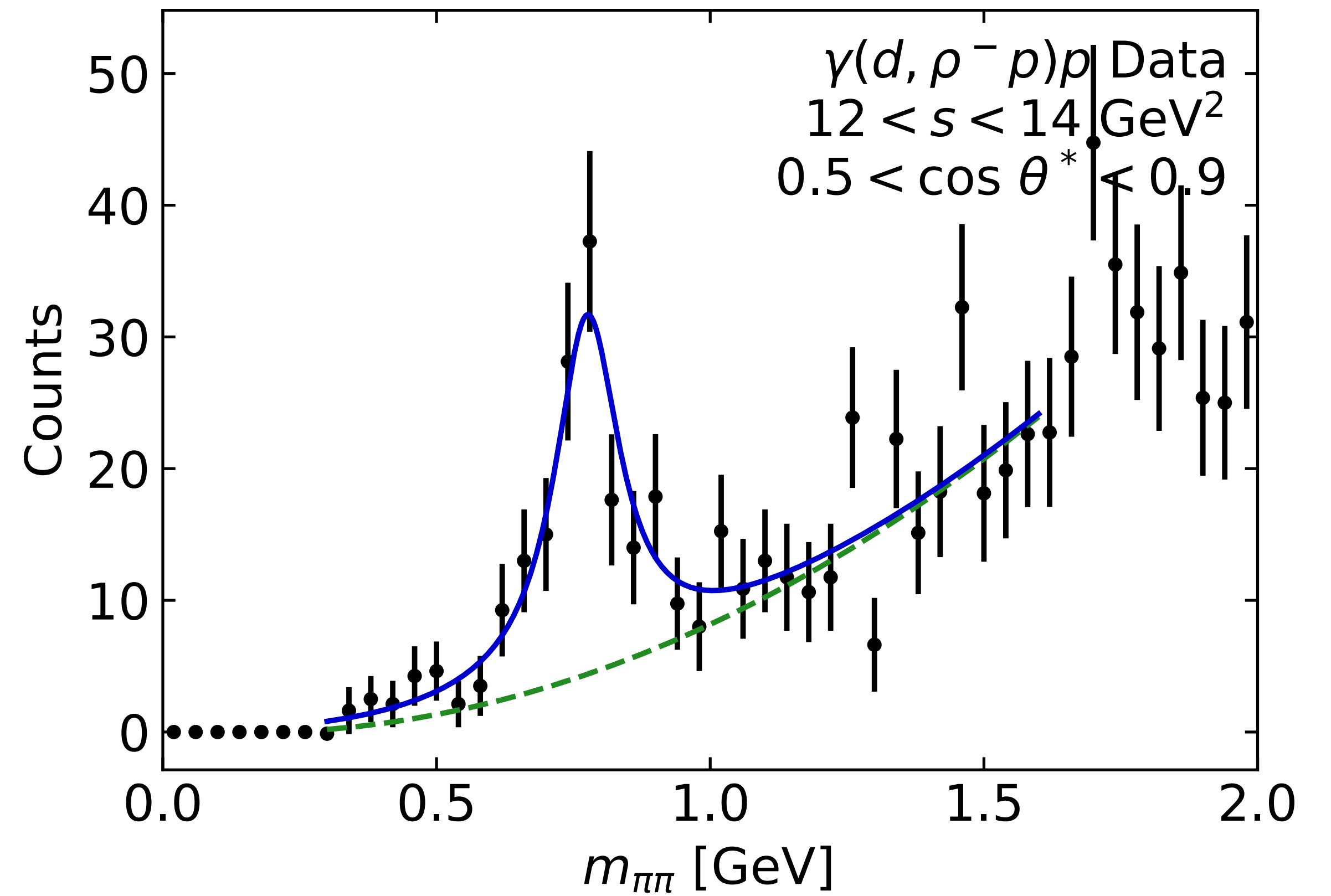
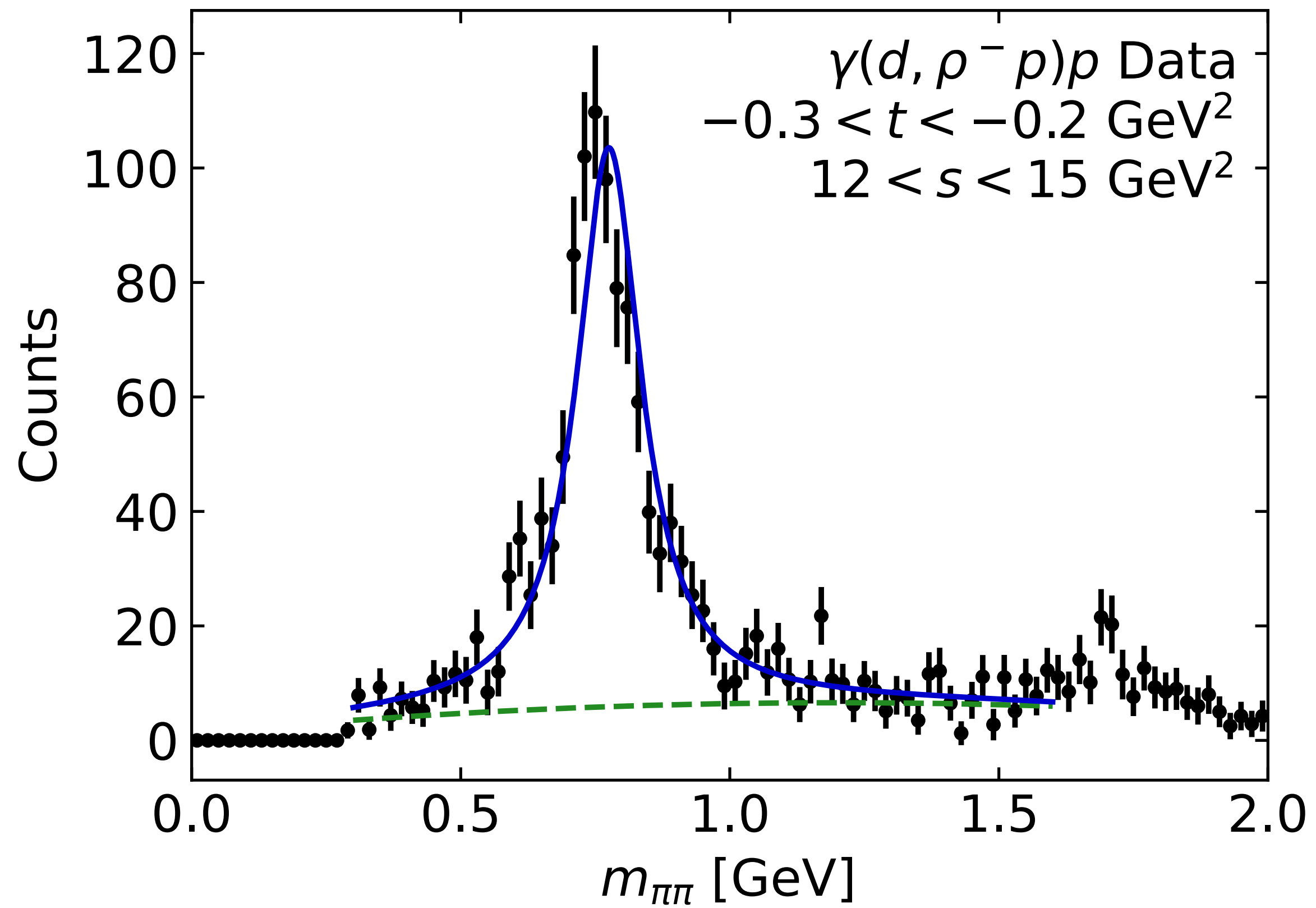
Event selection results in prominent ρ^- mass peak over background



Background level is not constant over all kinematics



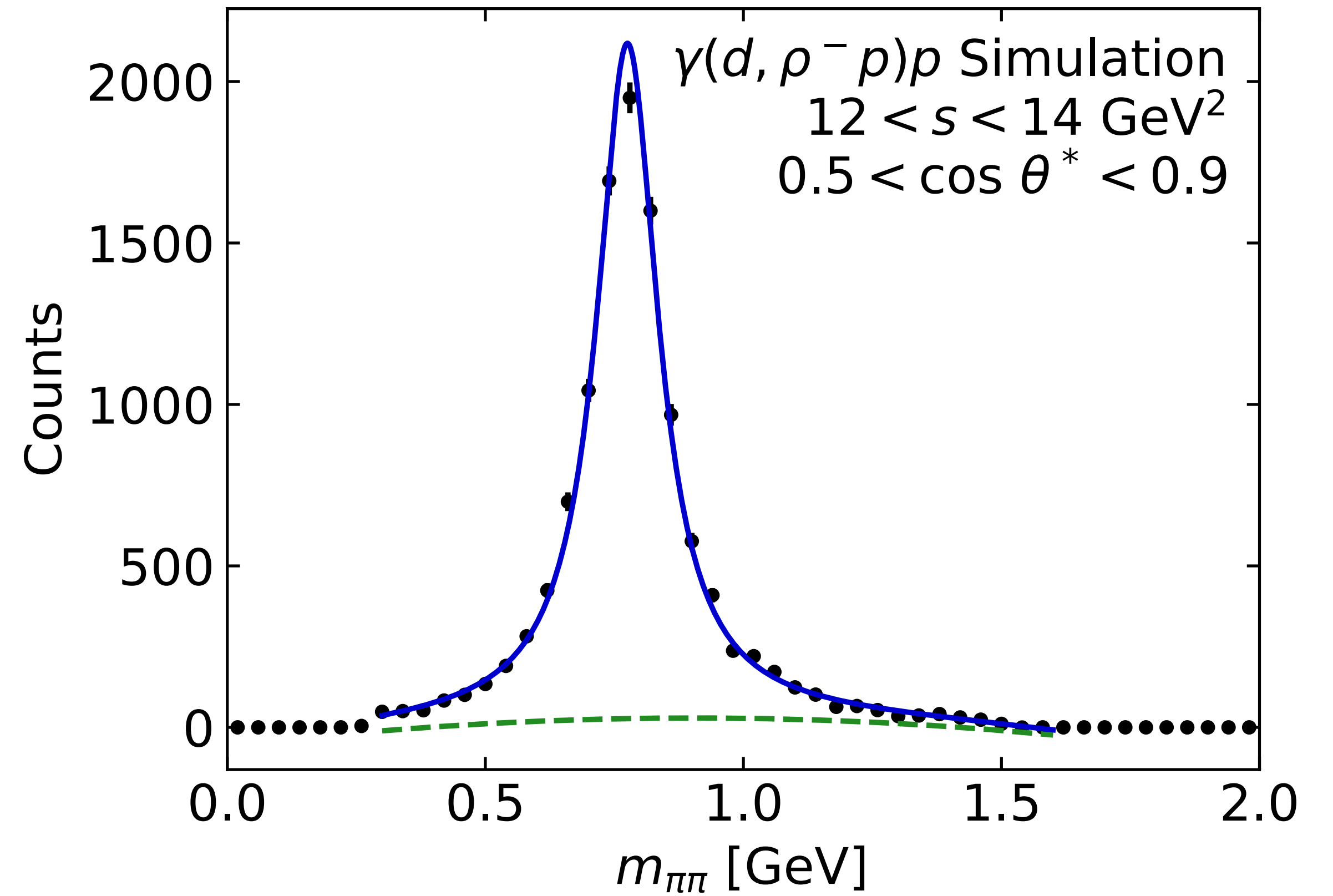
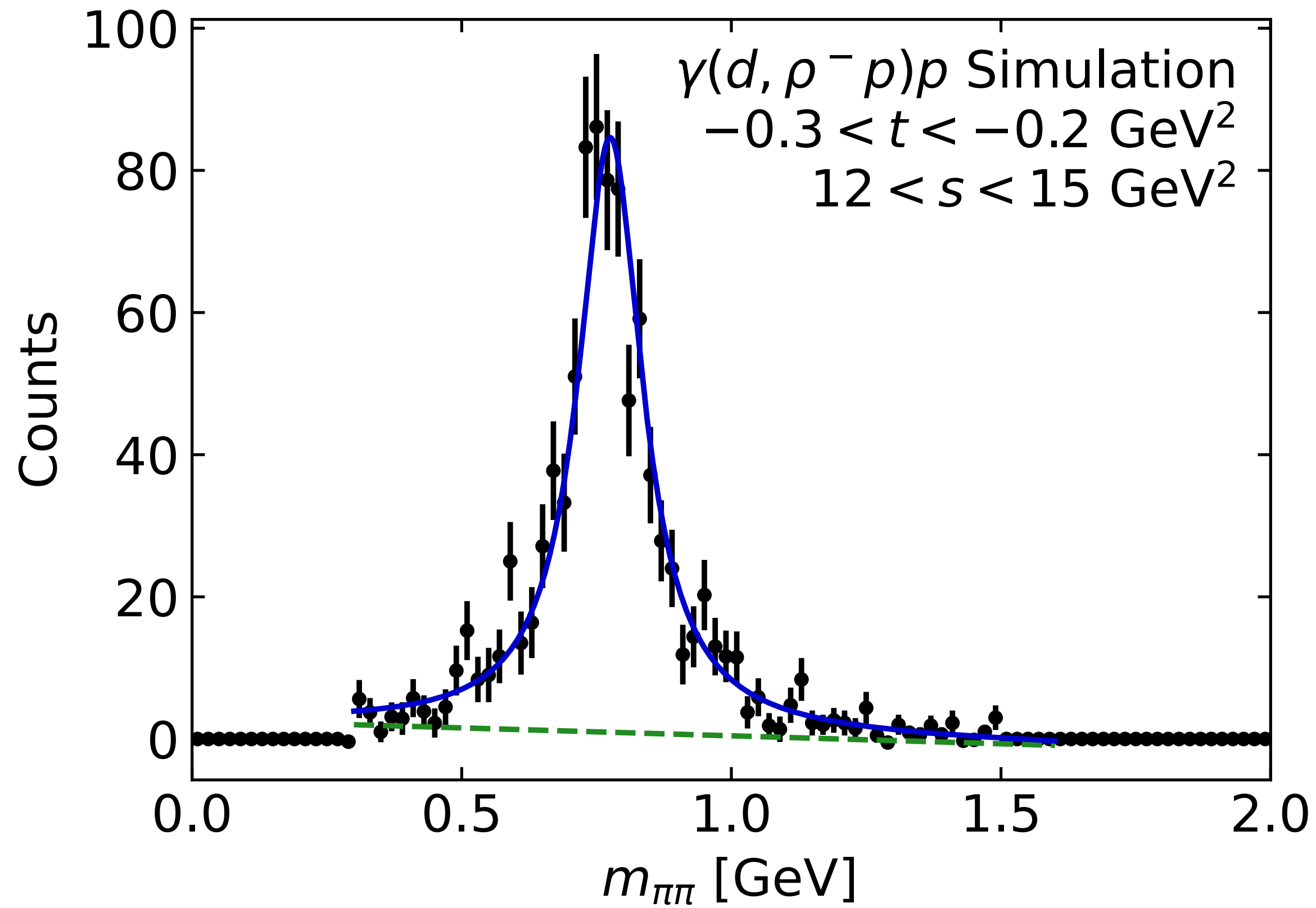
ρ^- yield estimated by fitting Breit-Wigner curve + polynomial background in each kinematic bin



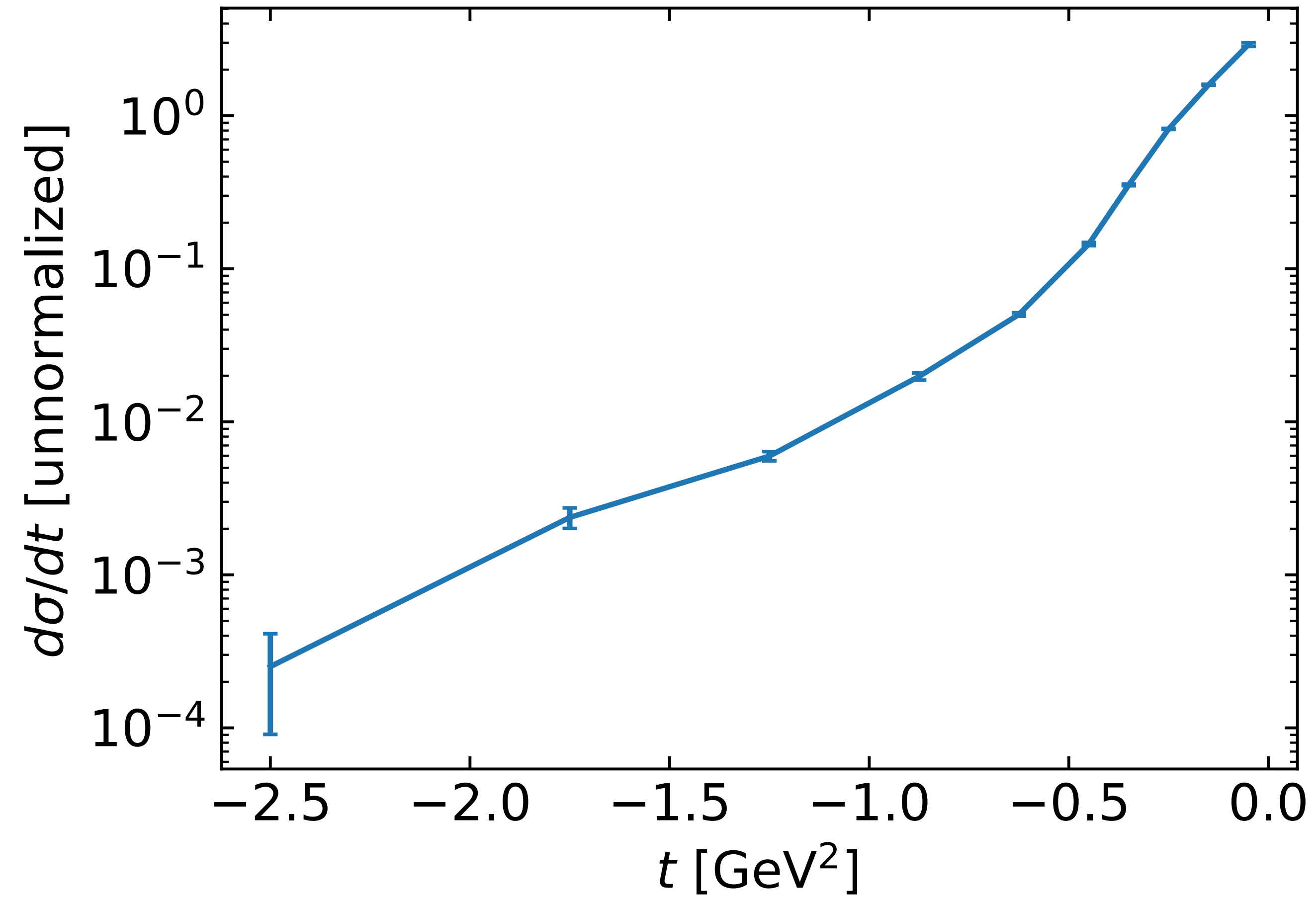
Conversion to cross section

- Yield in each kinematic bin is a function of cross section, acceptance, efficiency, and phase space
- Simulation allows us to account for acceptance, efficiency, and phase space to extract the cross section
- Simulated $\gamma d \rightarrow \rho^- pp$ events, assuming a flat cross section of $\frac{d\sigma}{dt}(\gamma n \rightarrow \rho^- p) = 1 \text{ nb GeV}^{-2}$
- Passed events through GEANT and event selection and examined same mass histograms

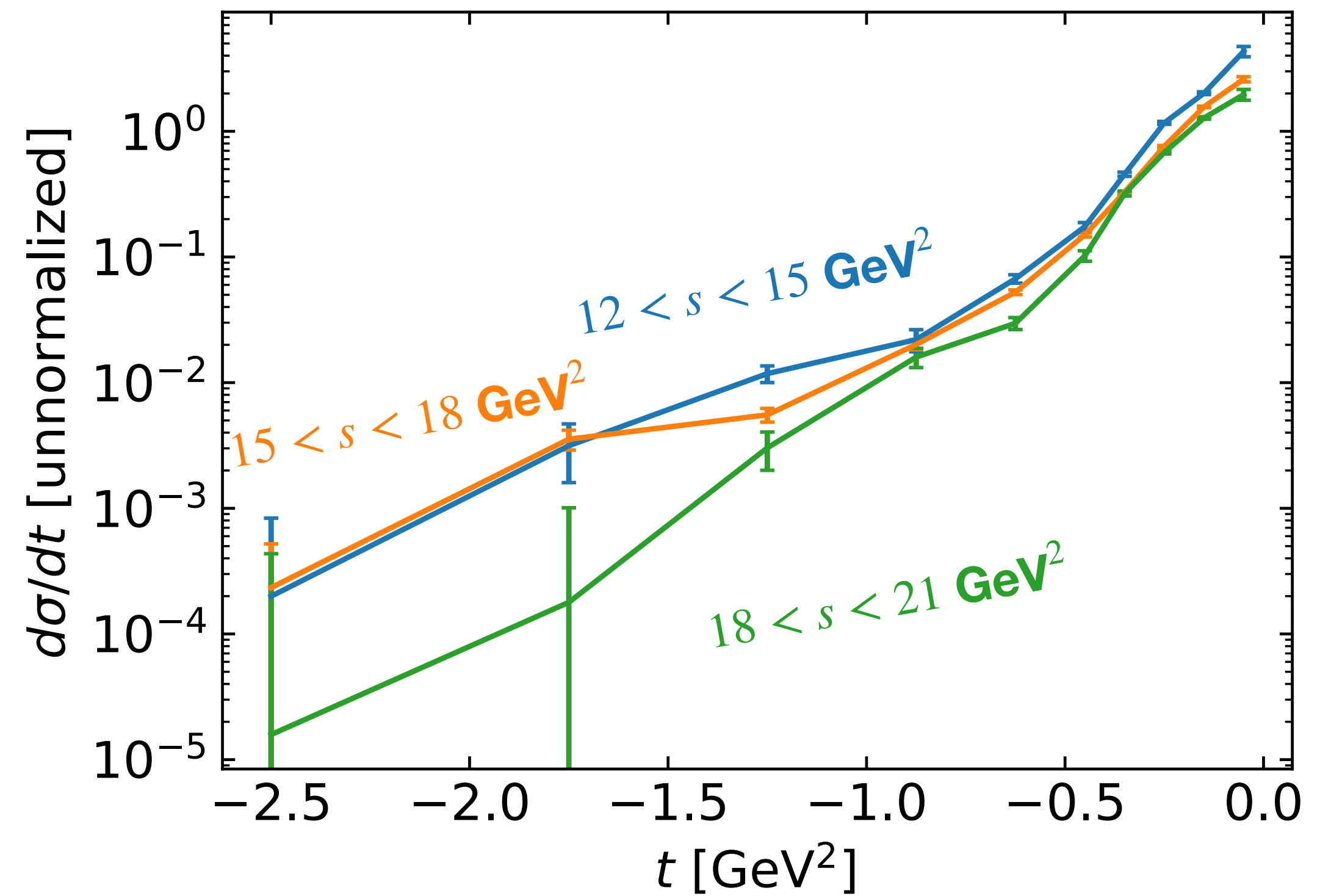
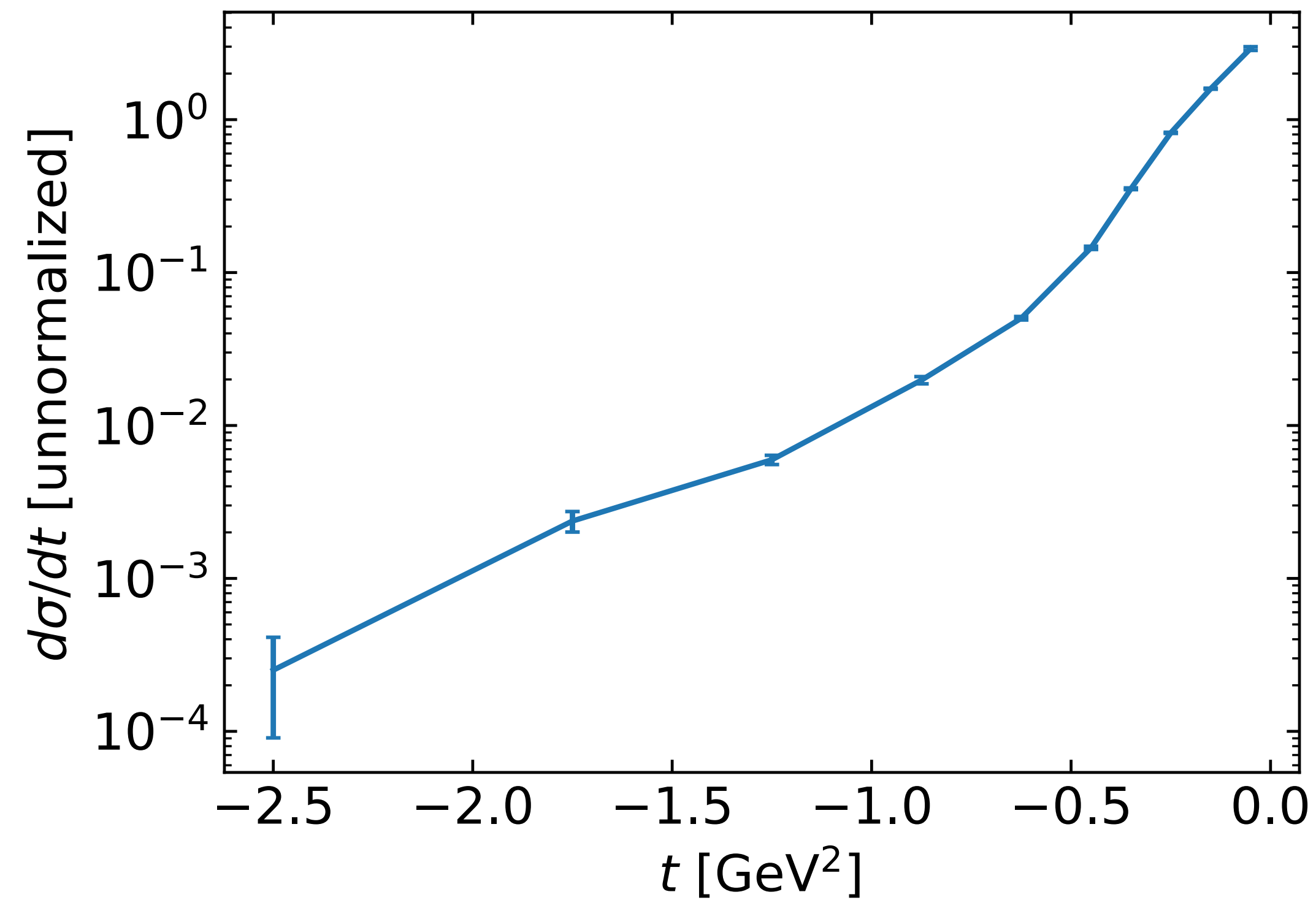
Amplitude of fitted mass peak in simulation give normalization factor for dividing simulation



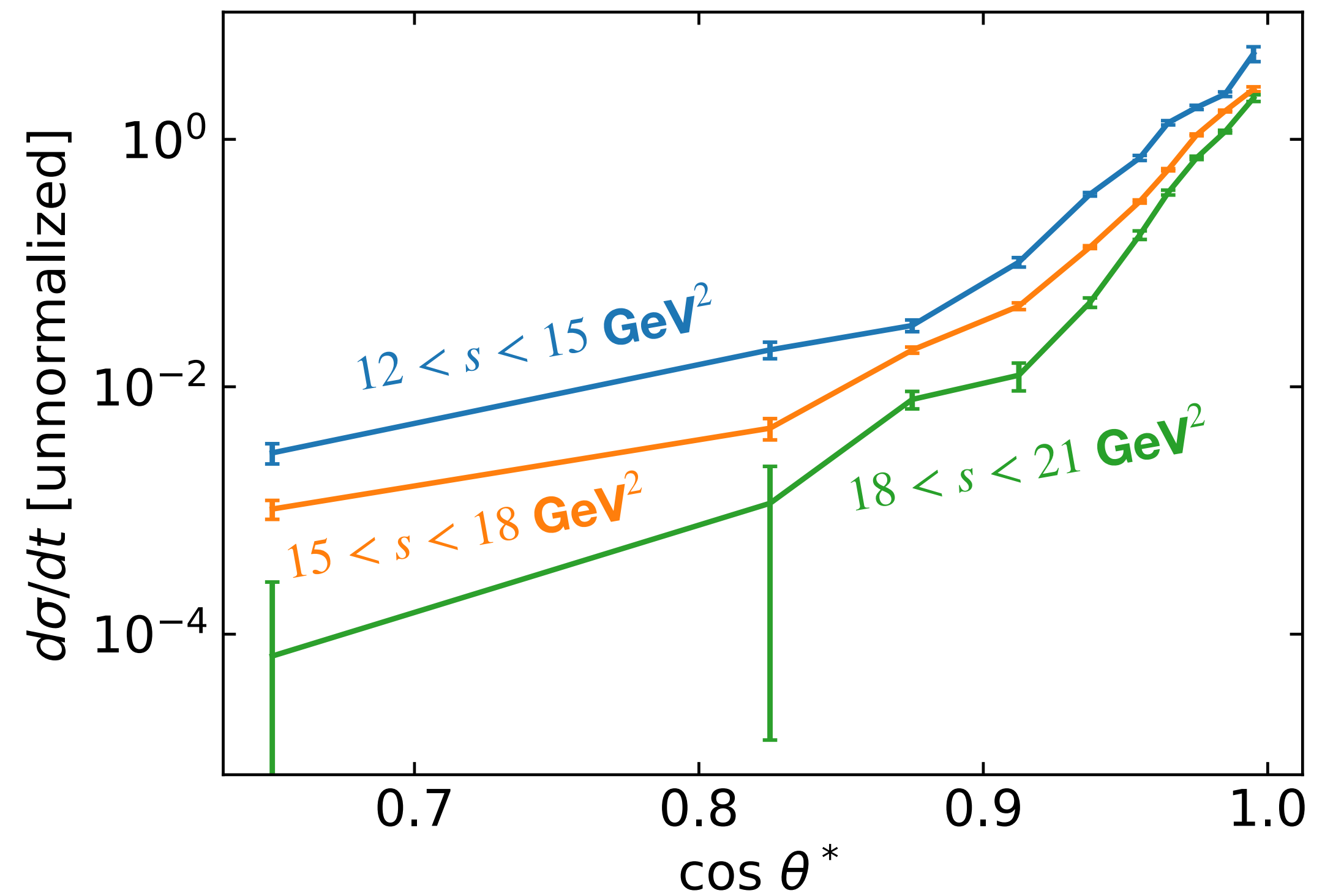
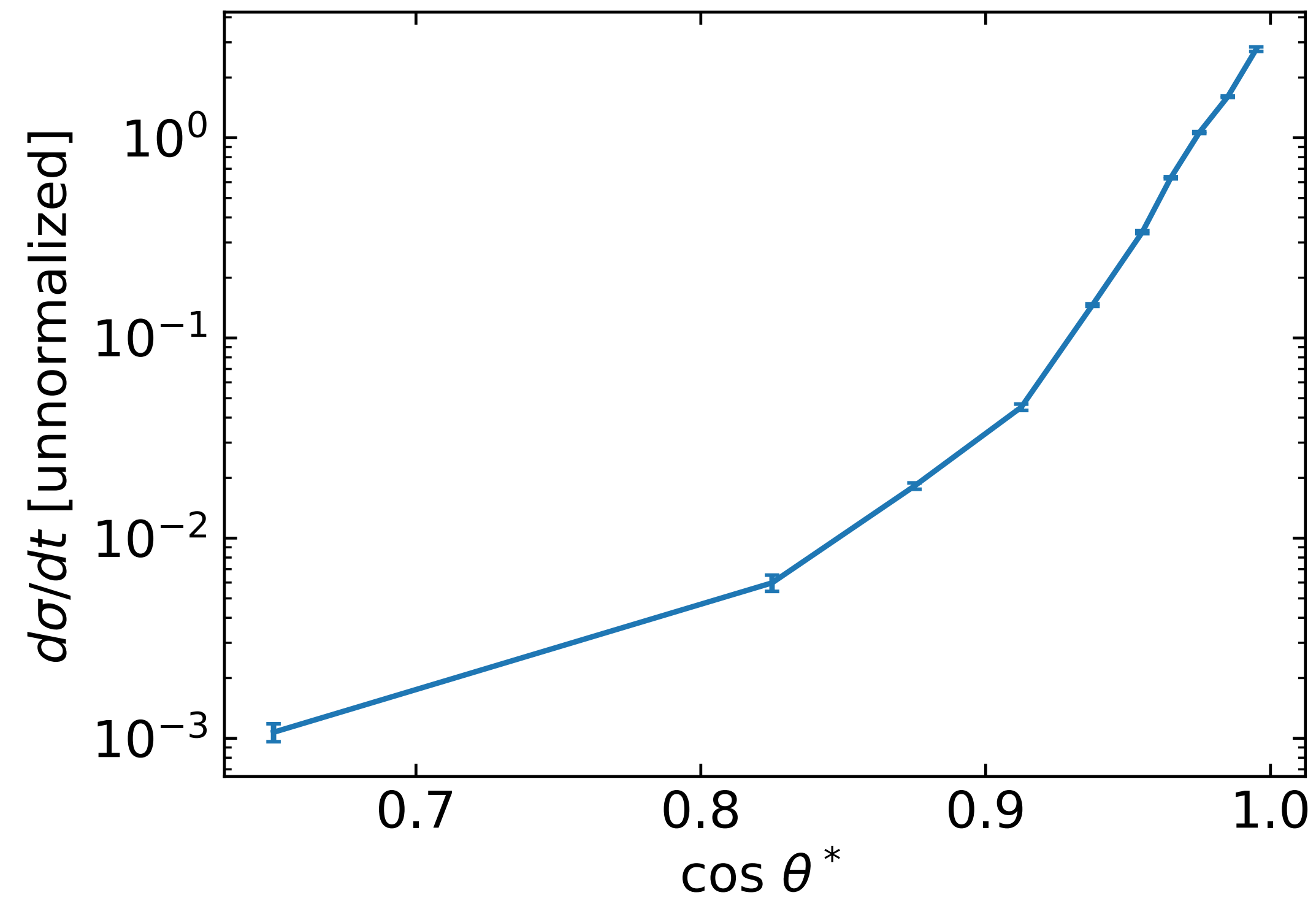
Cross section binned in t



Cross section binned in t and s



Cross section binned in $\cos \theta_{CM}$ and s



Cross section s -dependence; $n = -7$ expected

