Isolation of $(\gamma, \rho^- p)$ SRC Signal

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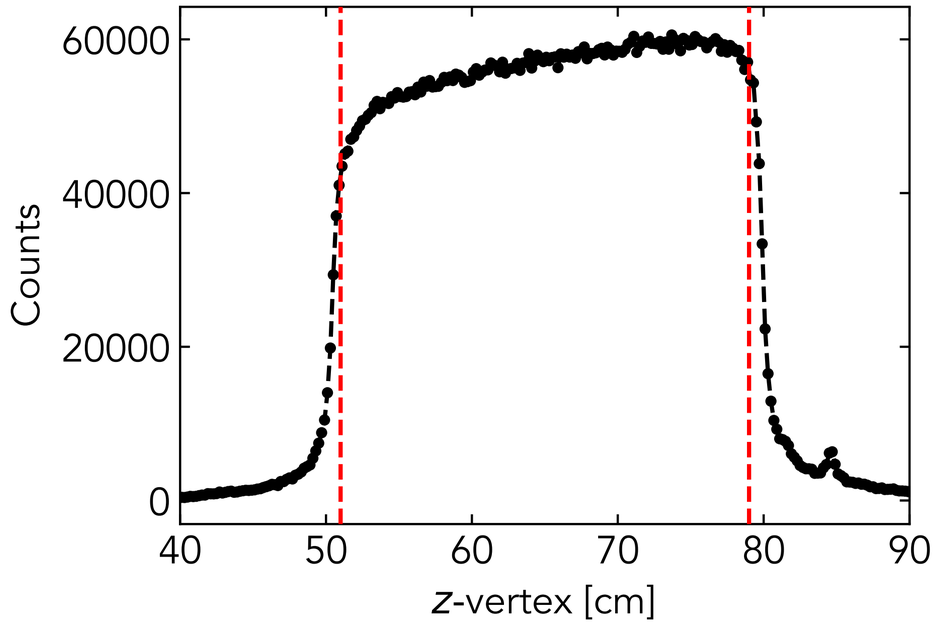
Overview

- Motivation: Comparison of $(\gamma, \rho^- p)$ and $(\gamma, \rho^- pp)$ gives measure of isospin structure of SRC using photoproduction

- Challenge: Extra proton cleans up SRC signal from diffractive 3-pion background, but without extra proton signal-background separation is challenging.

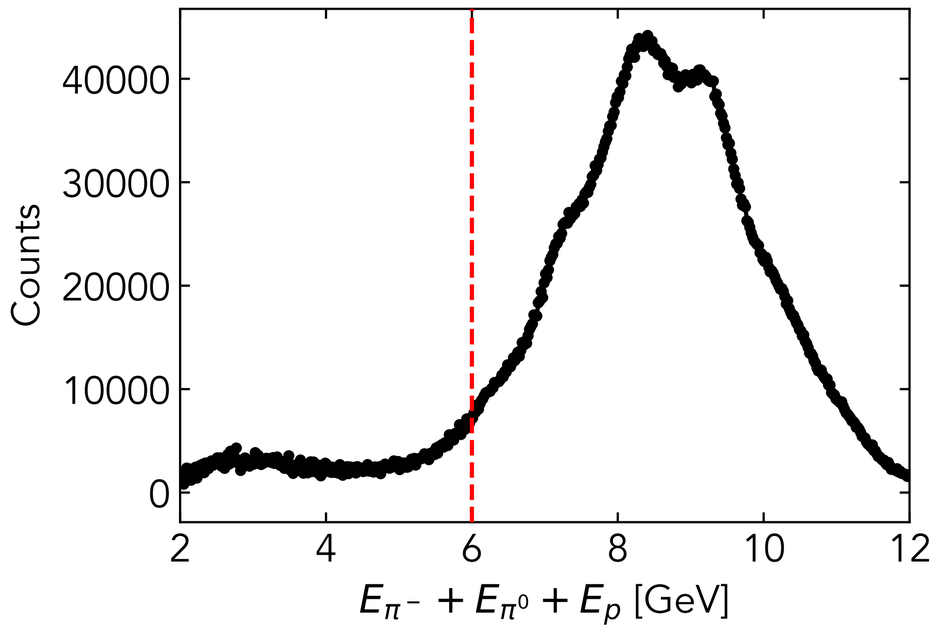
$(\gamma, \rho^- p)$ Event Selection

- Vertex position



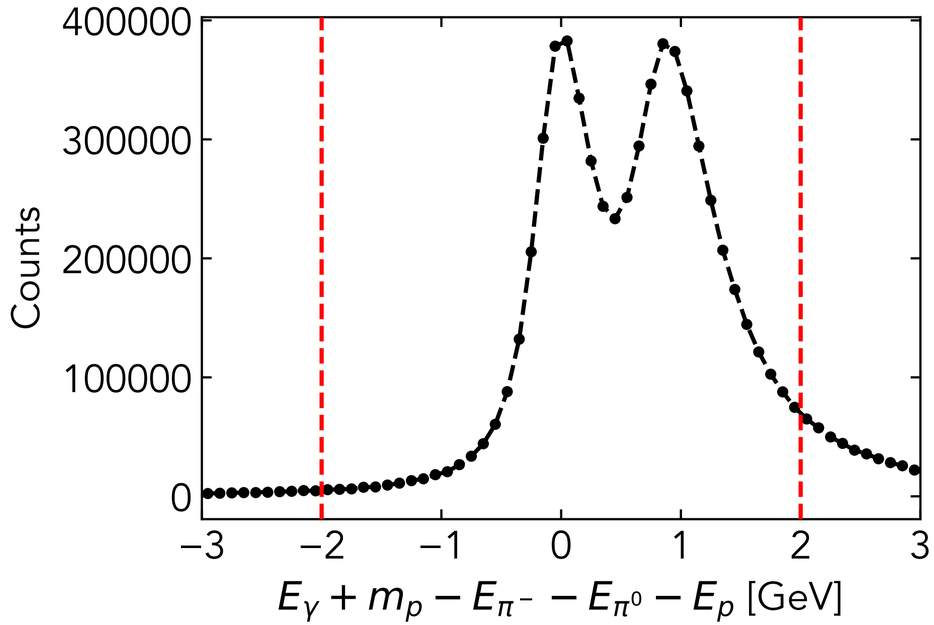
$(\gamma, \rho^- p)$ Event Selection

- Vertex position
- Total measured energy



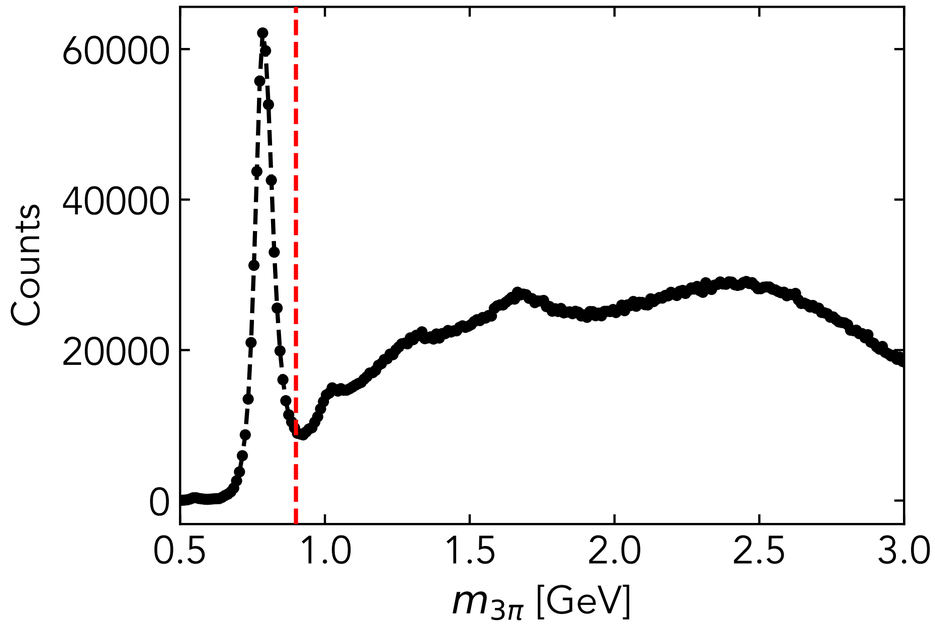
$(\gamma, \rho^- p)$ Event Selection

- Vertex position
- Total measured energy
- Missing Energy



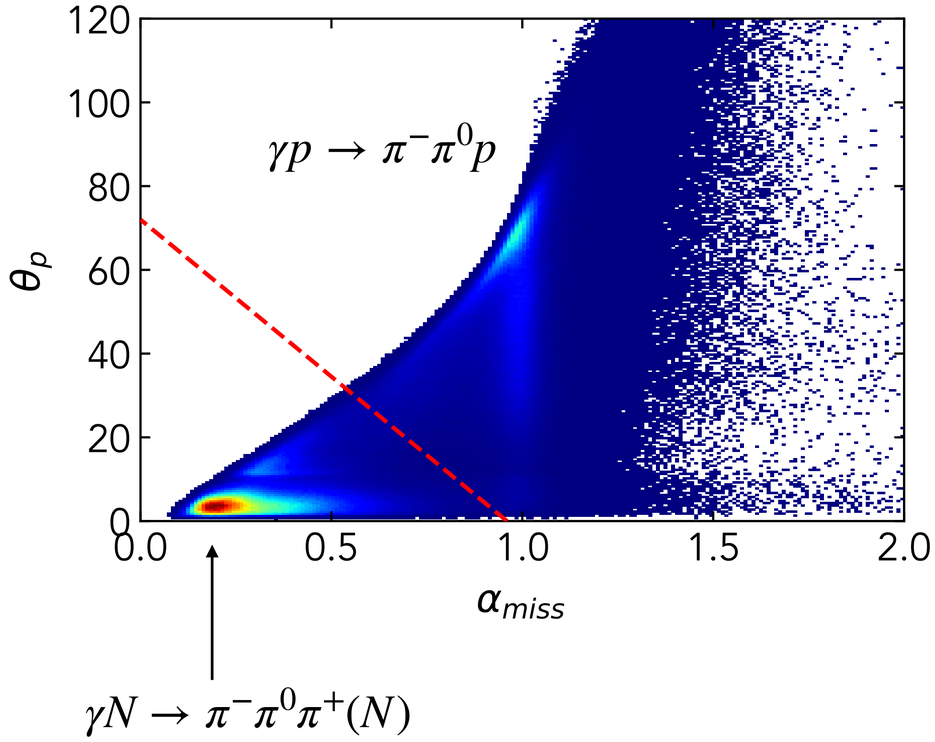
$(\gamma, \rho^- p)$ Event Selection

- Vertex position
- Total measured energy
- Missing Energy
- ω meson cut

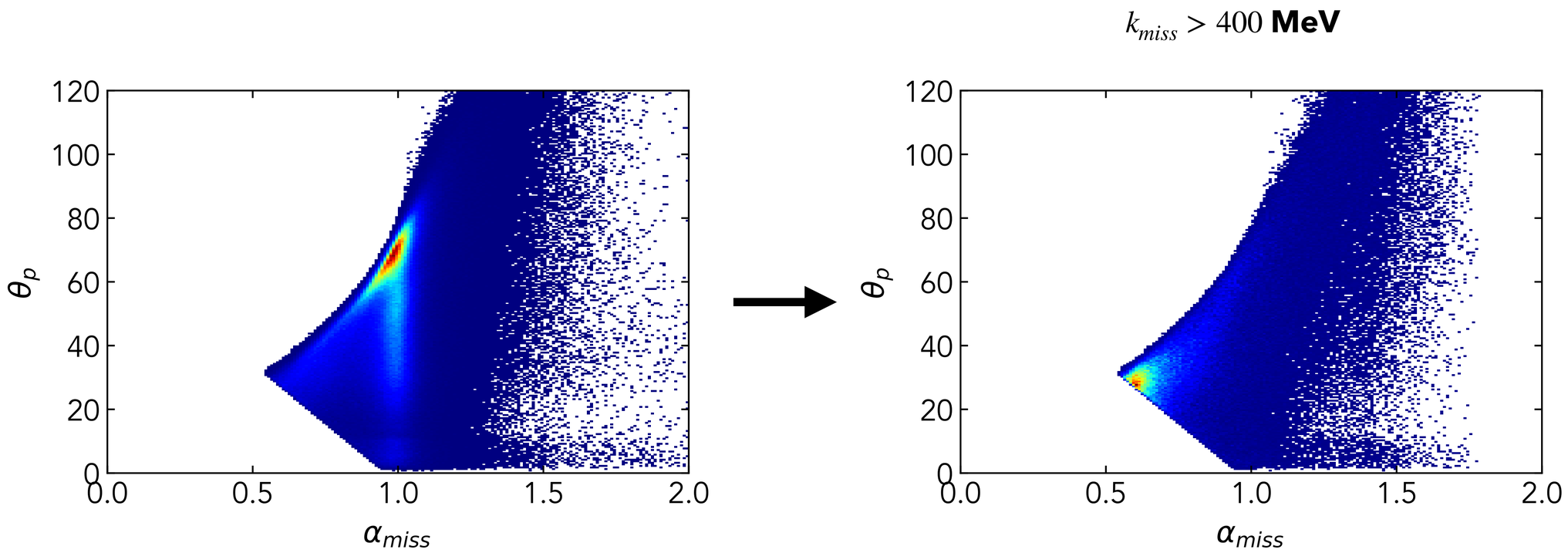


$(\gamma, \rho^- p)$ Event Selection

- Vertex position
- Total measured energy
- Missing Energy
- ω meson cut
- Diffractive angular cut?



Problem: Large missing momentum blurs between signal and background



Inclusive meson photoproduction

- Conservation of 4-momentum when scattering from standing nucleon:

$$p_\gamma + p_N = p_M + p_{N'}$$

- Here p_M is the total 4-momentum of the measured meson system, which may be ambiguous depending on missing particles or mis-identified particles
- Defining 4-momentum transfer:

$$\Delta_M \equiv p_\gamma - p_M$$

Inclusive meson photoproduction

- Conservation of 4-momentum:

$$\Delta_M + p_N = p_{N'}$$

- Square both sides:

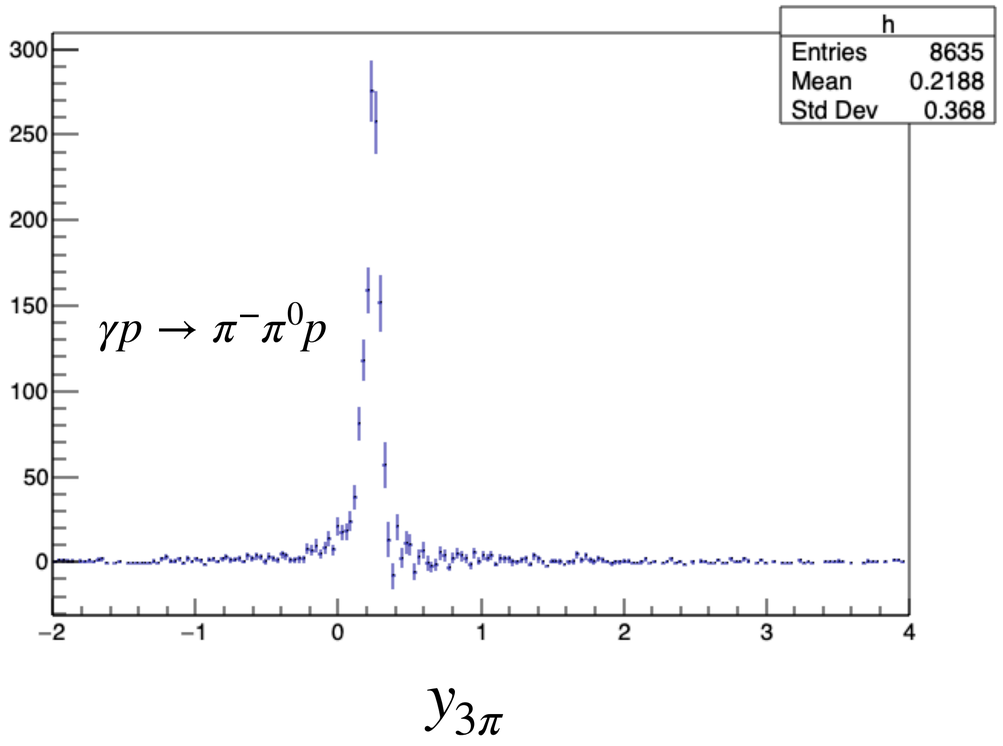
$$t_M + 2\Delta_M \cdot p_N + m_N^2 = m_N^2$$

- For scattering from a standing nucleon:

$$y_M \equiv \frac{-t_M}{2\Delta_M \cdot p_N} = \frac{-t_M}{2m_N(E_\gamma - E_M)} = 1$$

3-pion quasielastic peak clearly separated

Deuterium SRC Simulation



Deuterium Data