

Geant4 Study of Backgrounds in π^0 Photoproduction

Background process of concern

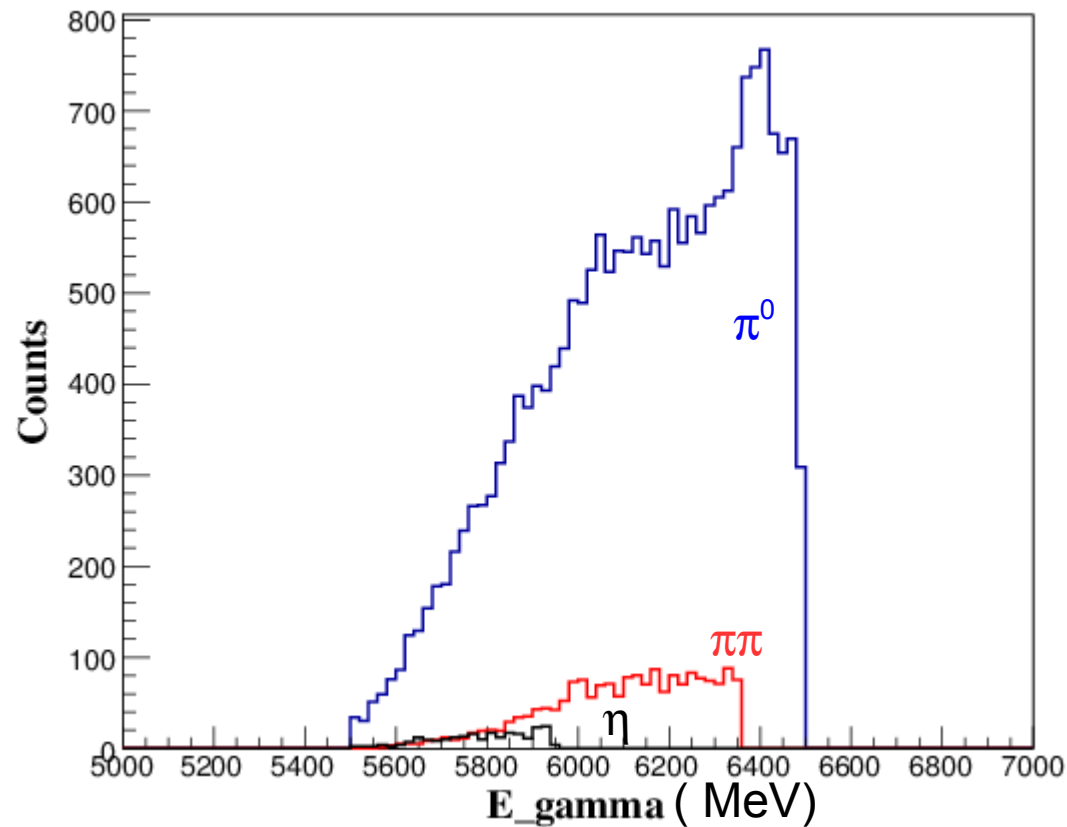
(beyond those studied by the RCS collaboration)

- Multi-pion production ($\gamma + p \rightarrow p + \pi^0 \pi$)
- Eta production ($\gamma + p \rightarrow p + \eta$)

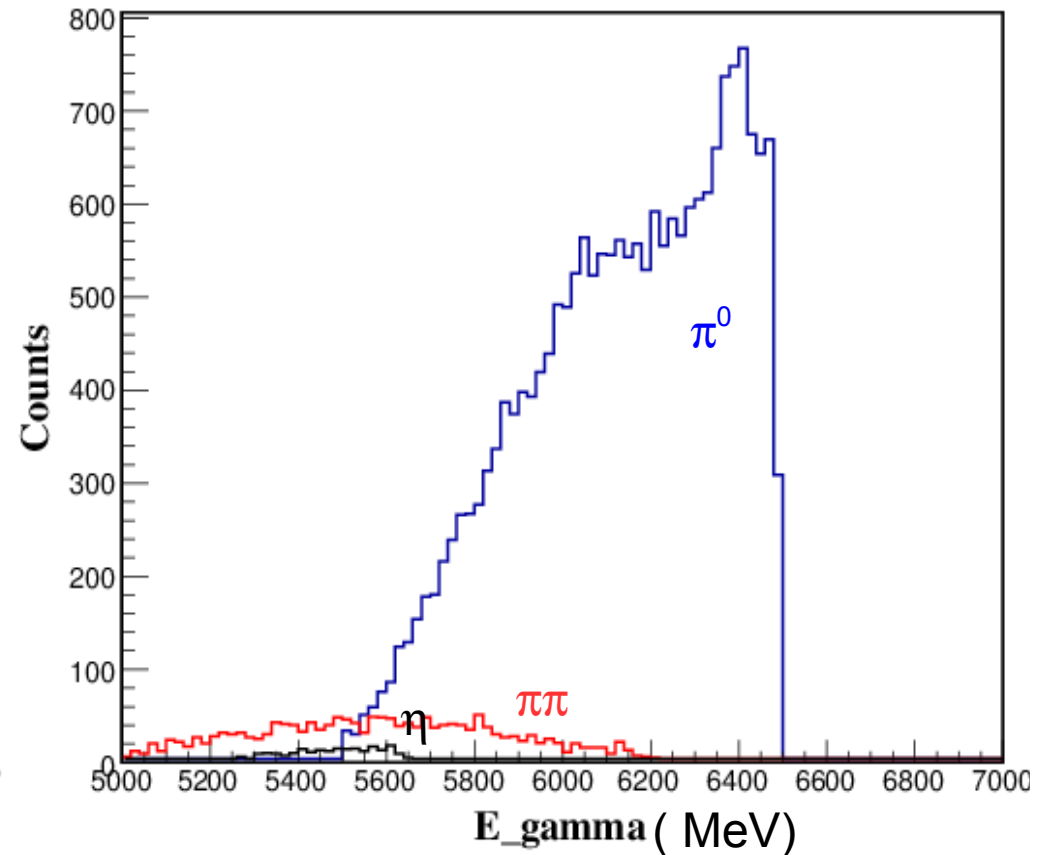
Cross sections obtained from Durham Reaction Database extended to desired kinematics using constituent scaling rules

Simulated and Reconstructed E_γ

For $E_e = 6.6$ GeV, 90° CM angle



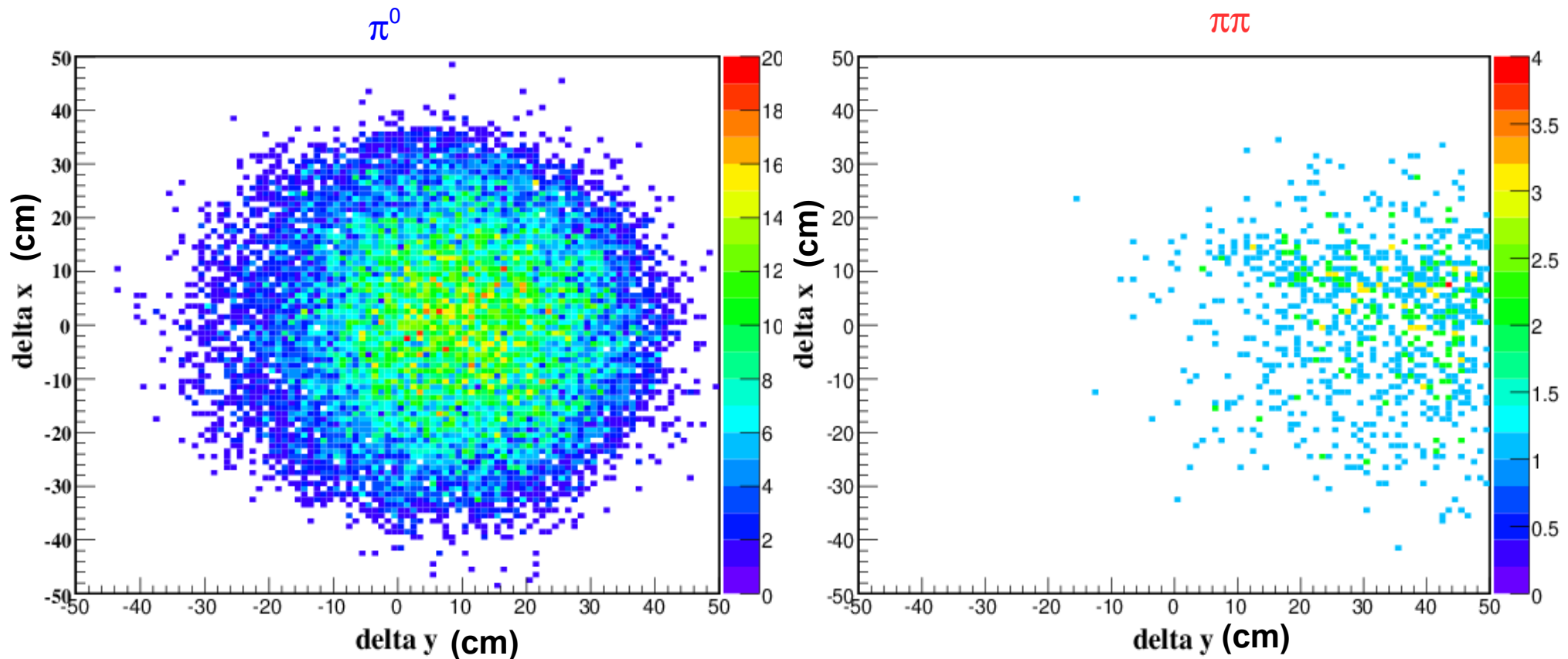
Generated E_γ



Reconstructed E_γ

NPS Hit Difference

- Difference between predicted and measured positions (δx and δy)

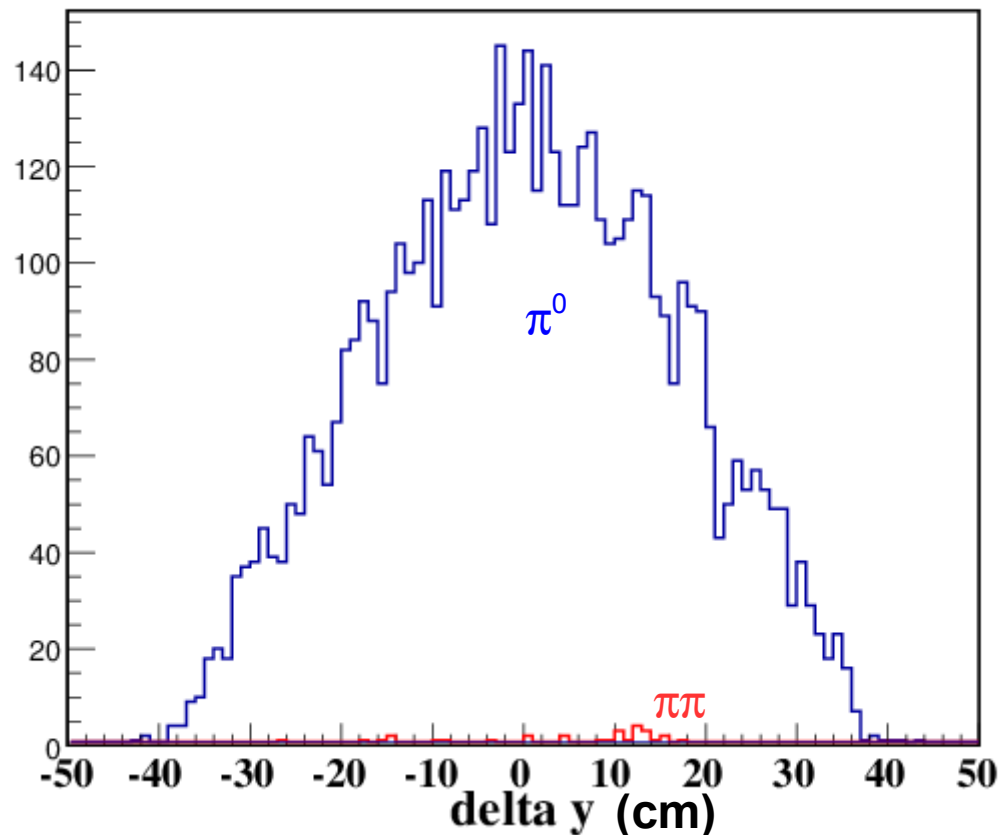


NPS Hit Difference

- Difference between predicted and measured positions (δx and δy)

$$\text{abs}(\delta x) < 2 \cdot \sigma_x$$

(for this setting
 $\sigma_x = 4.4 \text{ cm}$)



< 0.3% contamination

Optimization of NPS Distance & Magnet Distance & Field

Optimization studies conducted for 6.6 GeV kinematics only

- Maximize e-deflection
- Minimize NPS x and y resolution
- Minimize Background/Signal ratio

For 90° CM angle, optimal NPS position = 9 m,
magnet position = 2.45m, and field = 0.16 T

Other 2 settings still being optimized