Study of Coherent π^0 Photoproduction on the Deuteron
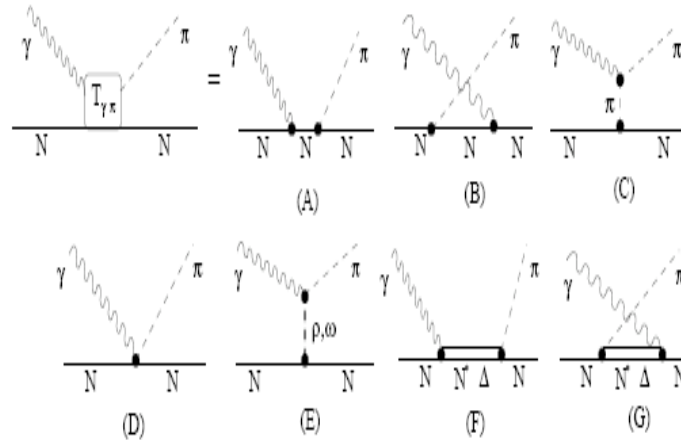
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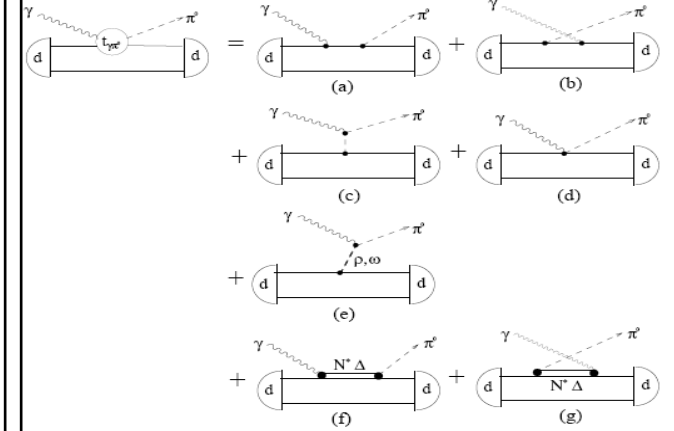
Motivation

• Understanding the hadronic systems, particularly their internal structure.

• Excellent tool for study of nucleon resonances.

• Obtain more information about the elementary neutron amplitude.
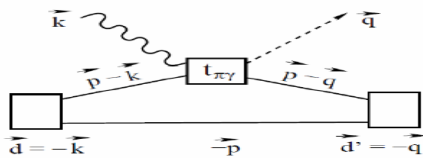
Pion Photoproduction on a Single Nucleon

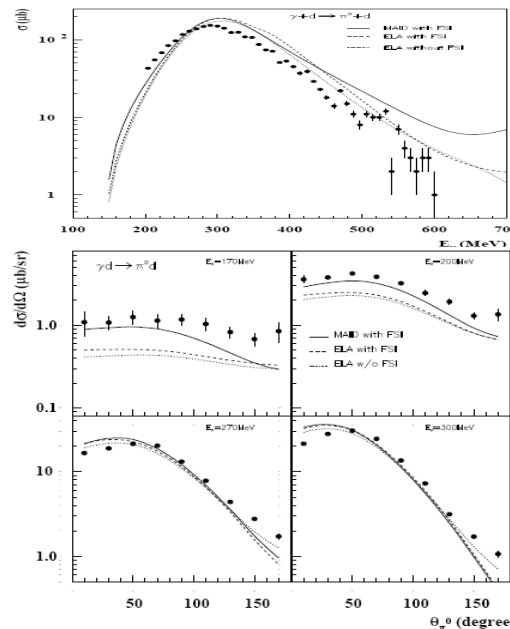## Pion Photoproduction on the Deuteron

kinematics

momenta

$$k = \frac{W_{\gamma d}^2 - M_d^2}{2 W_{\gamma d}} = E_\gamma^{lab}$$

$$q = \frac{\sqrt{[W_{\gamma d}^2 - (M_d - m_{\pi^0})^2][W_{\gamma d}^2 - (M_d + m_{\pi^0})^2]}}{2 W_{\gamma d}}$$

Invariant mass

$$W_{\gamma d} = E_\gamma^{lab} + \sqrt{\vec{k}^2 + M_d^2}$$
$$= E_{\pi^0} + \sqrt{\vec{q}^2 + M_d^2}$$
$$= \sqrt{M_d^2 + 2 M_d E_\gamma^{lab}}$$

Results

Conclusion

• The coherent neutral photoproduction from deuteron is investigated in pure IA for E_γ from threshold up to 1 GeV.

• For the deuteron wave function, we used the CD-Bonn potential model.

• For the element amplitudes, we use the Effective Lagrangian Approach (ELA), and the unitary isobar model (MAID).

• Good agreement found between theoretical models and experimental data.