

# Second-order pion-nucleus potential for scattering and photoproduction

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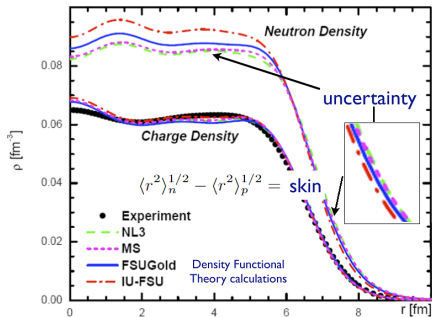
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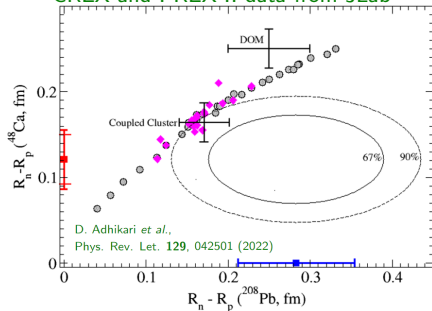
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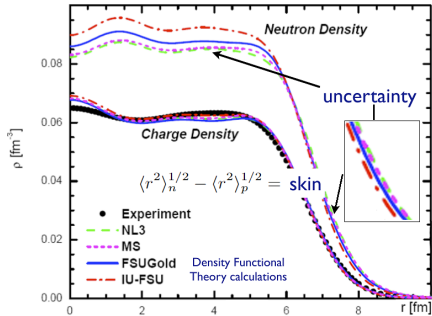
# $\pi^0$ photoproduction – a tool for studying neutron distributions



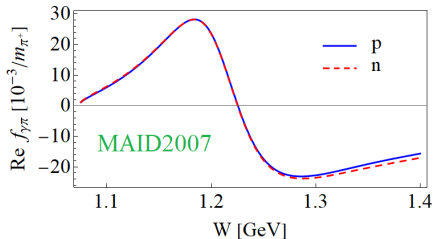
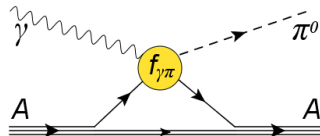
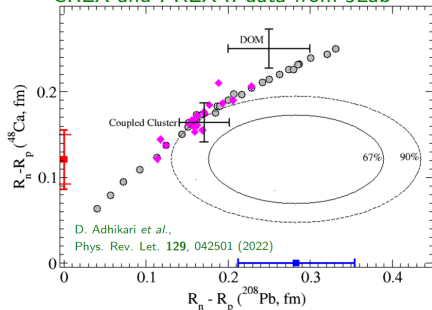
## CREX and PREX-II data from JLab



# $\pi^0$ photoproduction – a tool for studying neutron distributions



## CREX and PREX-II data from JLab



$\pi^0$  photoproduction provides nucleon FF:

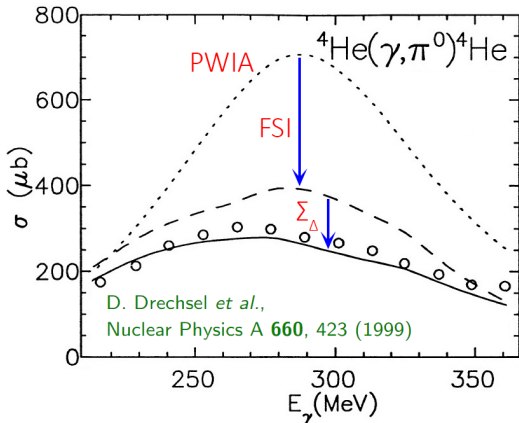
$$V_{\gamma\pi} \propto f_{\gamma\pi} F_N(q)$$

Neutron distribution can be extracted:

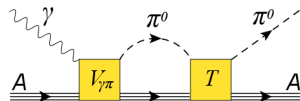
$$F_n(q) = F_N(q) - F_p(q)$$

**Precise theoretical model for photoproduction on nuclei is required**

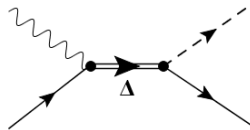
### 3 photoproduction components:



- $V_{\gamma\pi}$  for PWIA
- scattering amplitude  $T$  for FSI

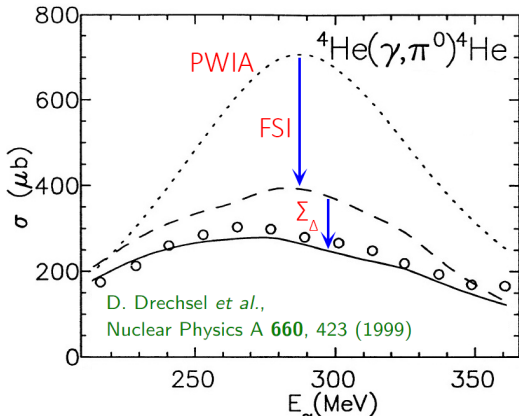


- Effective  $\Delta(1232)$  self-energy  $\Sigma_\Delta$



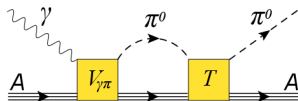
$$G_\Delta^{\text{bound}} = (W - m_\Delta + i\Gamma_\Delta/2 - \Sigma_\Delta)^{-1}$$

## 3 photoproduction components:

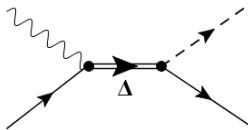


similar to  $\pi$  production in  $\nu$  scattering

- $V_{\gamma\pi}$  for PWIA
- scattering amplitude  $T$  for FSI



- Effective  $\Delta(1232)$  self-energy  $\Sigma_\Delta$



$$G_\Delta^{\text{bound}} = (W - m_\Delta + i\Gamma_\Delta/2 - \Sigma_\Delta)^{-1}$$

## Outlook:

- Scattering: new potential fitted to  $\pi^\pm$ - $^{12}\text{C}$  scattering data
- 3 energy-independent real parameters
- Inclusion of the intermediate charge exchange and spin-flip
- Application of our model to photoproduction