Physics models for coherent nuclear DVCS

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Outline:

- Impulse approximation for nuclear GPDs
- Enhancement of nuclear DVCS asymmetries
- Codes for nuclear GPDs and A_{LU} based on the dual parametrization for proton GPDs

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Impulse approximation for nuclear GPDs

- Nuclear GPD = (sum of unmodified proton and neutron GPDs) x nuclear FF,

Guzey, Strikman, PRC 68 (2003) 015294; Guzey, PRC 78 (2008) 025211

$$H_A^q(x,\xi_A,Q^2,t) = \left|\frac{dx_N}{dx}\right| \left[Z \left(H^{q/p}(x_N,\xi_N,Q^2,t) + \frac{t}{4m_N^2} E^{q/p}(x_N,\xi_N,Q^2,t) \right) + N \left(H^{q/n}(x_N,\xi_N,Q^2,t) + \frac{t}{4m_N^2} E^{q/n}(x_N,\xi_N,Q^2,t) \right) \right] F_A(t)$$

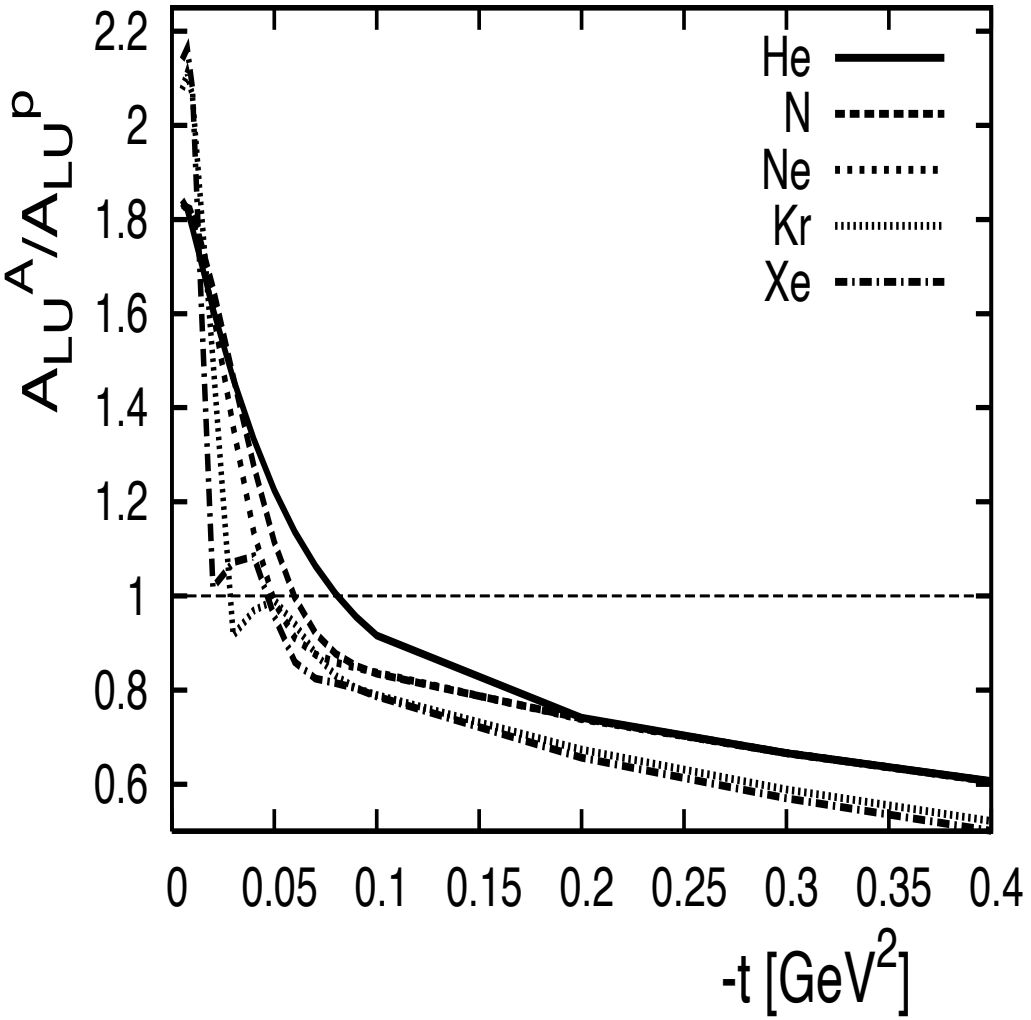
$$\xi_A = \frac{x_A}{2-x_A}, \quad \xi_N = \frac{x_B}{2-x_B} \qquad \frac{\xi_N}{1+\xi_N} = A\frac{\xi_A}{1+\xi_A}$$

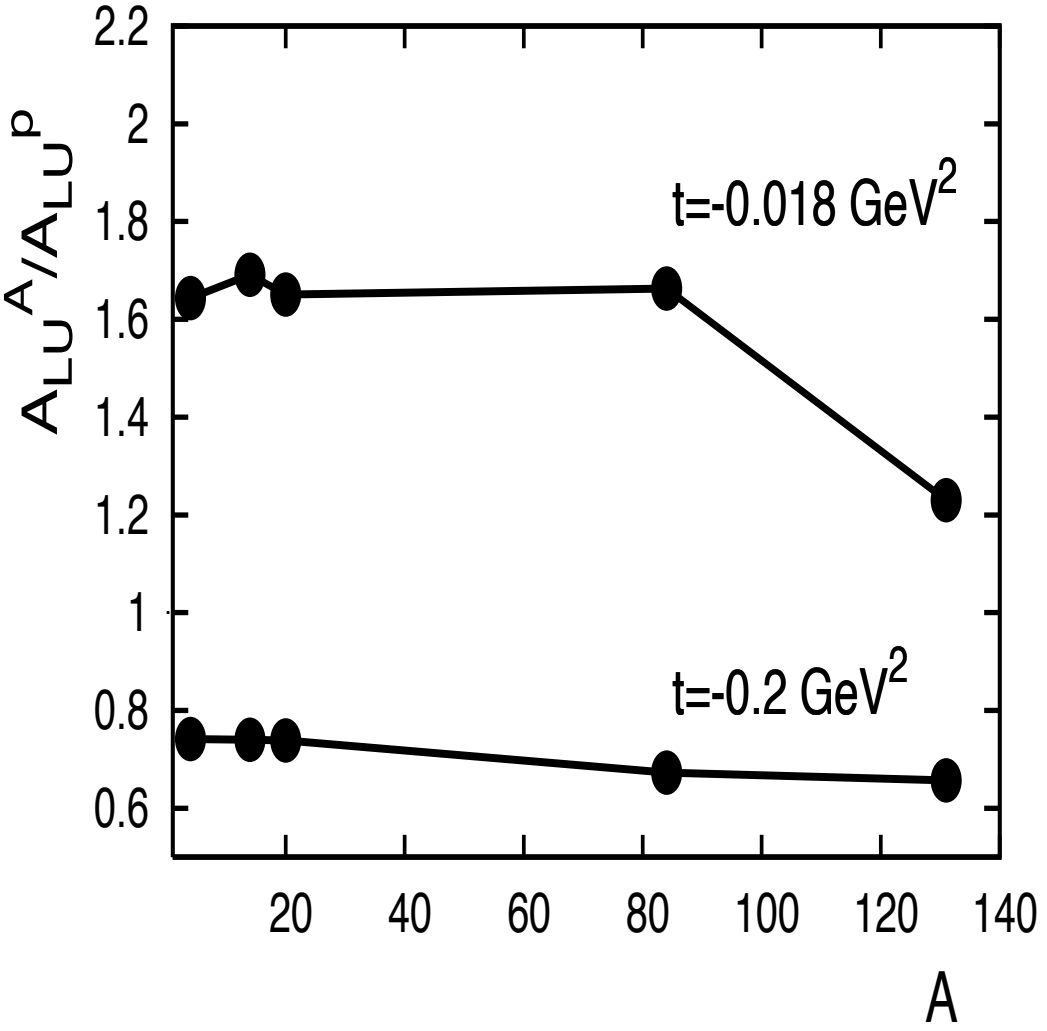
- The model
  - satisfies the baryon number and momentum sum rules in the forward limit
  - gives the nuclear form factor $F_A(t)$ for the first x-moment
  - in general, violates polynomiality

- The model naturally predicts enhancement of DVCS beam-spin asymmetry at small |t|: A_{LU}(nucleus)/A_{LU}(proton) ~ **A/Z**

Enhancement of nuclear DVCS asymmetries

$$x_B = 0.065,\ Q^2 = 1.7\ \mathrm{GeV}^2\ [34] \text{ and } \phi = 90^\circ.$$





Guzey, PRC 78 (2008) 025211

Codes for nuclear GPDs

- For nucleon GPDs, we used the corrected dual parametrization, Guzey, Teckentrup, PRD 74 (2006) 054027 and PRD 79 (2009) 017501

- For calculation of DVCS cross section and asymmetries, leading-twist BMK formalism, Belitsky, Mueller, Kirchner, Nucl. Phys. B629 (2002) 323

- For nuclear form factors, parametrization for He-4, Frosch, McCarthy, Rand, Yearian, Phys. Rev. 160 (1967) 874 and nuclear density from the tables, De Jager, De Vries, De Vries, Atom. Data Nucl. Data Tabl. 36 (1987) 495

- Fortran codes for the calculation of the beam-spin DVCS asymmetry $\mathbf{A_{LU}}$ for **He-4, N-14, Ne-20, Kr-84, Xe-131**, http://hepd.pnpi.spb.ru/~vguzey/Dual_nuclear_2009.html

- Kinematic coverage: $0.01 < x_B < 0.5$, $1 < Q^2 < 10$ GeV2, $0.005 < |t| < 1$ GeV^2

- The codes use grids for proton and neutron CFFs H and E. For the GPD E, one specifies the values of $-0.6 < J_u < 0.6$, $-1 < J_d < 1$.