

Theoretical framework

- ▶ sum rule

X. Ji hep-ph/9603249, 9710290

$$J^q = \frac{1}{2} \int dx x (H^q + E^q) \Big|_{\xi=0}^{t=0} \quad J^g = \frac{1}{2} \int dx (H^g + E^g) \Big|_{\xi=0}^{t=0}$$

$$\text{with } \frac{1}{2} = J^g + \sum_q J^q$$

impact parameter interpretation

M. Burkardt hep-ph/0505189

- ▶ $L^q = J^q - \frac{1}{2}\Sigma$ and $L^g = J^g - \Delta g$

with Σ and Δg from ordinary parton densities

- ▶ exclusive processes \rightsquigarrow GPDs $\rightsquigarrow J^q$ and (more difficult) J^g

- ▶ lattice $\rightsquigarrow \Sigma$ and J^q J^g difficult, Δg impossible

- ▶ lattice: directly integrals over x

exclusive (and inclusive) processes: $\int dx$ difficult

but x dependence is interesting

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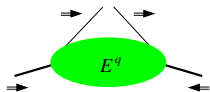
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$$E^{q,g} \leftrightarrow \Delta L^3 = 1$$

from helicity imbalance

M. Burkardt, G. Schnell hep-ph/0510249

How to get GPDs

- ▶ least known is $E \rightsquigarrow$ transverse target pol. (few exceptions)
- ▶ but also need H transv. target \rightsquigarrow combination of E and H
and must learn about interplay of x, ξ, t

aim: model dependent but well motivated GPD extraction

- ▶ best theory control and most detailed observables:
 - \rightsquigarrow DVCS and $ep \rightarrow ep \mu^+ \mu^-$, $\mu p \rightarrow \mu p e^+ e^-$
 - flavor separation u vs. $d \rightsquigarrow$ neutron target
 - in principle also DVCS with weak currents (high energy ν beams)
 - separation q vs. $g \rightsquigarrow$ in principle from Q^2 evolution

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- ▶ separate q and g : vector meson production \rightsquigarrow need large Q^2
at leading twist: $\sigma_L - \sin(\phi - \phi_S) \sigma_{00}^{+-}$

$$\begin{array}{ll}
 \gamma^* p \rightarrow \rho^0 p, \omega p & u + \bar{u}, d + \bar{d}, g \\
 \rho^+ n & u - \frac{1}{2}\bar{u} - (d - \frac{1}{2}\bar{d}) \\
 \phi p & s + \bar{s} + \frac{3}{4}g \\
 K^{*0} \Sigma^+ & d + \bar{d} - (s + \bar{s}) \text{ from flavor SU(3)}
 \end{array}$$

detailed tables in [hep-ph/0106012](#), [0307382](#), [0506171](#)

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- ▶ wide-angle processes $\gamma p \rightarrow \gamma p, p\bar{p} \rightarrow \gamma\gamma$
 \leftrightarrow GPDs at large negative or positive t
connection with input for Ji's sum rule ??