

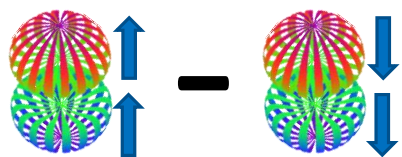
- [1] IA Rachek *et al*, PRL **98**, 182303 (2007)
 [2] P Hoodbhoy *et al*, Nucl. Phys. **B312**, 571 (1989)
 [3] FE Close, S Kumano, Phys. Rev. **D42**, 2377 (1990)

Tensor Spin Observables

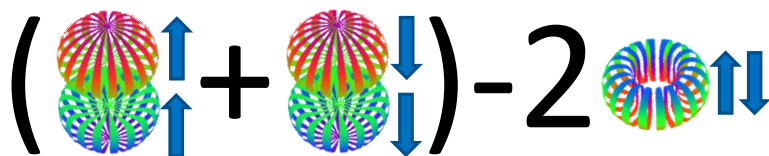
- [4] G Miller, Phys. Rev. **C89**, 045203 (2014)
 [5] SK Taneja *et al*, Phys. Rev. **D86**, 036008 (2012)
 [6] S Kumano, Phys. Rev. **D82**, 017501 (2010)

Property of spin-1 nuclei

Vector $P_z = p_+ - p_-$



Tensor $P_{zz} = (p_+ + p_-) - 2p_0$



Development of a high luminosity,
 high tensor polarized target has
 promise as novel probe of nuclear
 physics

Of all tensor observables, currently
 only elastic t_{20} is well measured^[1]

New tensor structure functions^[2]

$$W_{\mu\nu} = -F_1 g_{\mu\nu} + F_2 \frac{P_\mu P_\nu}{v} \\
 - b_1 r_{\mu\nu} + \frac{1}{6} b_2 (s_{\mu\nu} + t_{\mu\nu} + u_{\mu\nu}) \\
 + \frac{1}{2} b_3 (s_{\mu\nu} - u_{\mu\nu}) + \frac{1}{2} b_4 (s_{\mu\nu} - t_{\mu\nu}) \\
 + i \frac{g_1}{v} \epsilon_{\mu\nu\lambda\sigma} q^\lambda s^\sigma \\
 + i \frac{g_2}{v^2} \epsilon_{\mu\nu\lambda\sigma} q^\lambda (p \cdot q s^\sigma - s \cdot q p^\sigma)$$

JLab E12-13-011, A- Rating, C1 Approved
 Tensor Structure Function b_1

Close-Kumano sum rule^[3]

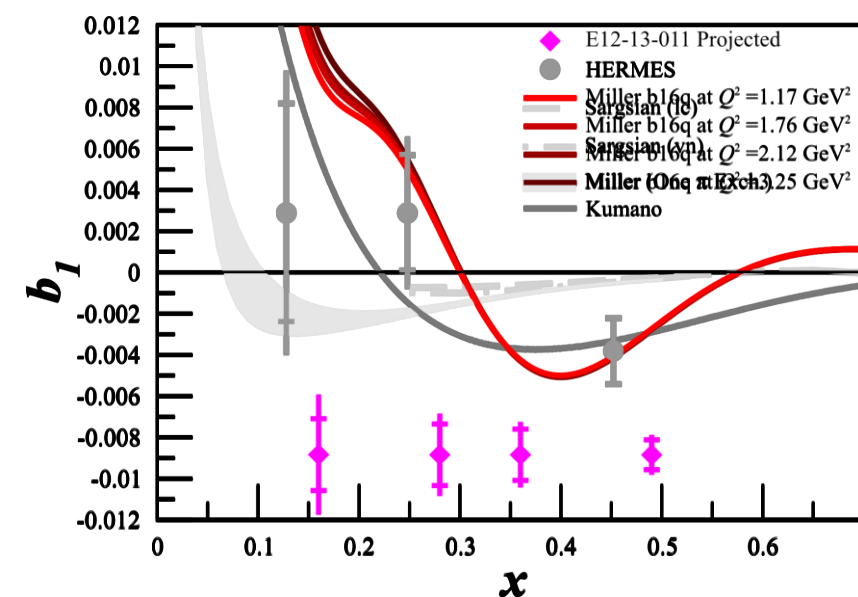
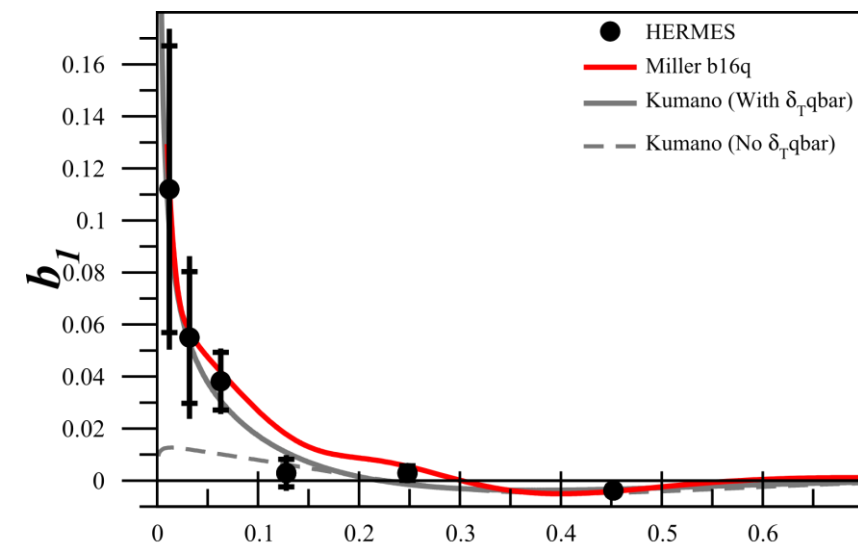
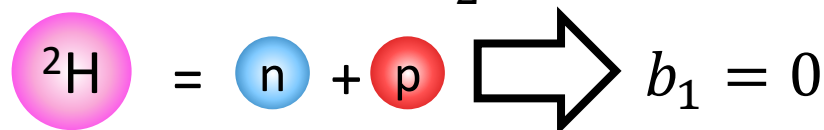
6-quark hidden color^[4]

OAM^[5]

Pionic effects^[4,6]

Polarized sea quarks^[6]

$$b_1 = \frac{q^0(x) - q^\pm(x)}{2}$$



Tensor Spin Observables

JLab LOI12-14-002: Tensor Asymmetry

A_{zz} in the $x > 1$ Region

Similar to t_{20} , but in QE

SRCs and pn dominance

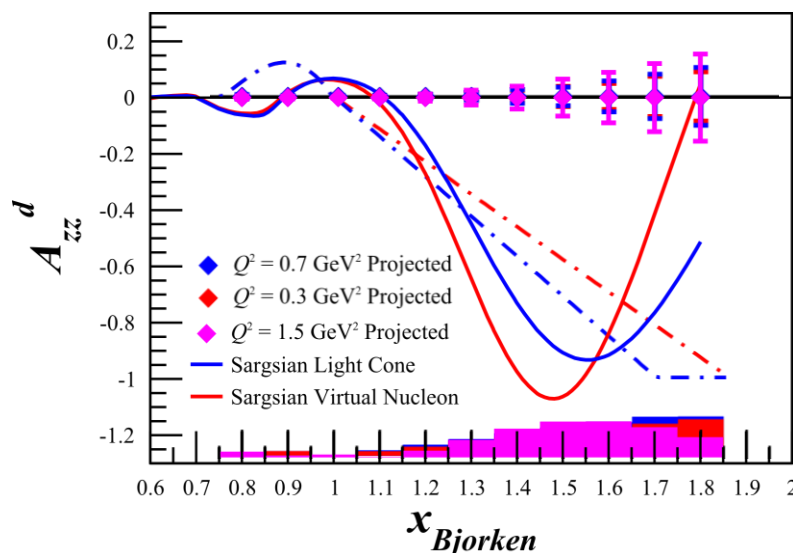
Direct probe of tensor force

Better understanding of s/d

Final state interaction models^[*]

Encouraged for full submission by PAC42

$$A_{zz} \propto \frac{\frac{1}{2}d^2 - sd}{s^2 + d^2}$$



JLab LOI12-14-001: Search for Exotic Gluonic States in the Nucleus

b_4 in $x < 0.3$ region

Insensitive to bound nucleons or pions

Any non-zero value indicates exotic gluonic components

Encouraged for full submission by PAC42

JLab E97-102: Measurement of the (e,e'p) Cross Section on Tensor-Polarized Deuterium

Sensitive to NN effects, similar to A_{zz}

Although approved with A-, it never ran

With 12 GeV upgrade, can run with 2×statistics

Future of Tensor Measurements

Upcoming approved measurement of b_1

2 upcoming proposals

2 structure functions to explore

13 proceedings from Tensor Workshop



Ideas to probe the tensor structure are growing, and it is paramount that a high luminosity, high tensor polarization target be developed to make the experiments possible