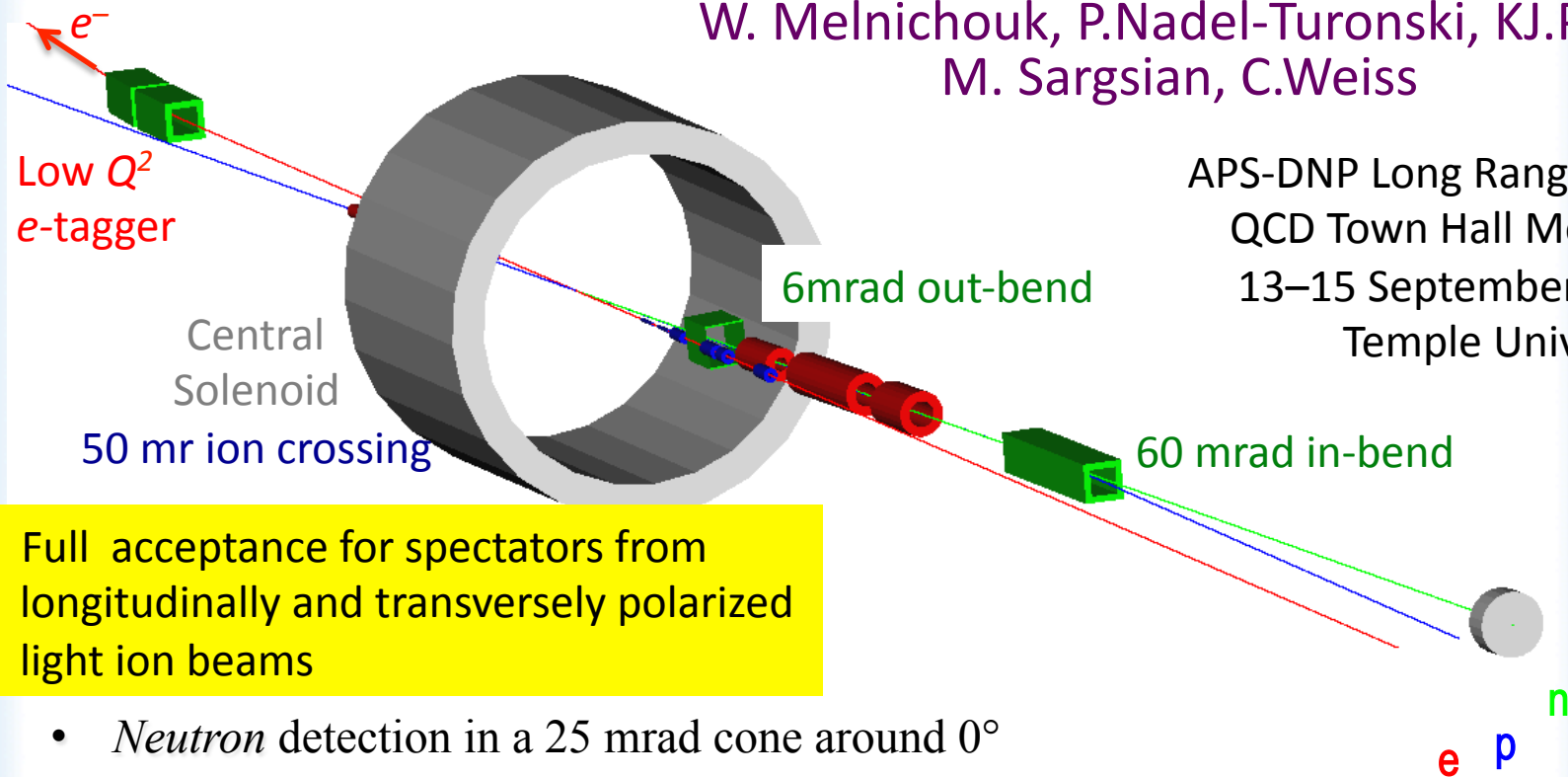


Neutron Spin Structure via Spectator Tagging at the EIC

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APS-DNP Long Range Plan
QCD Town Hall Meeting
13–15 September 2014
Temple University



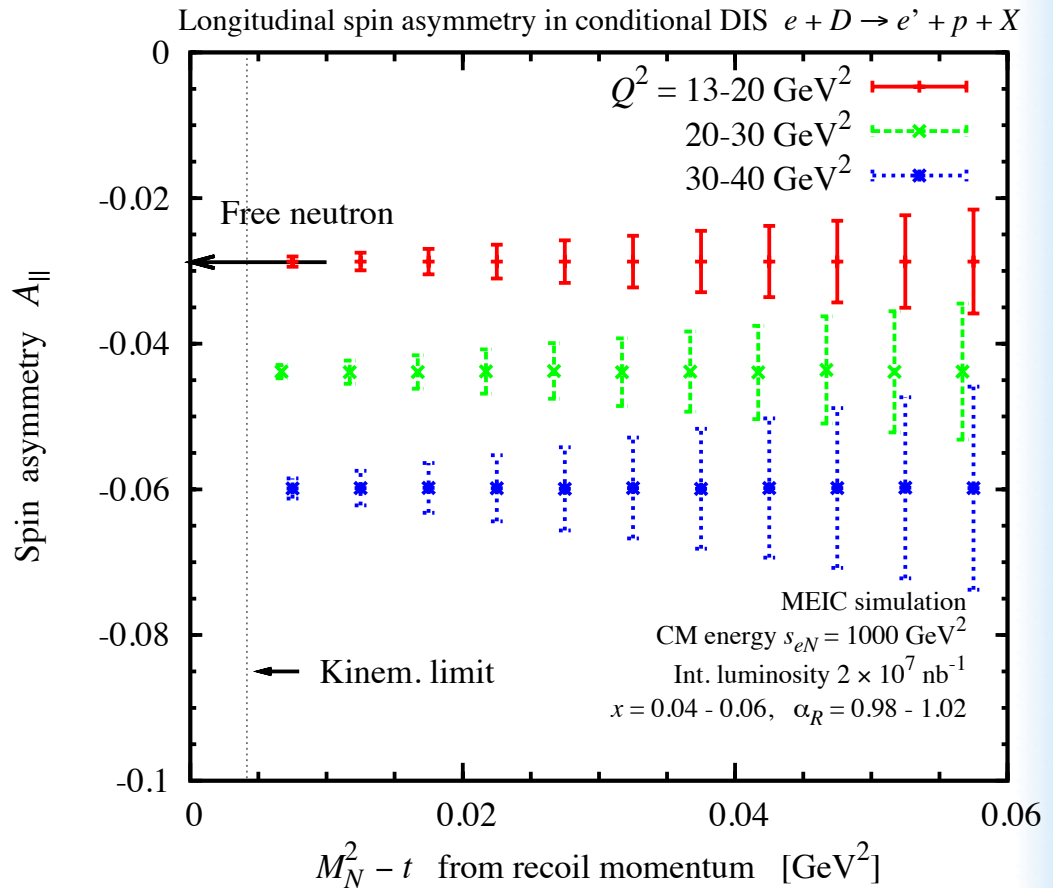
- Full acceptance for spectators from longitudinally and transversely polarized light ion beams

- *Neutron* detection in a 25 mrad cone around 0°
- Secondary high dispersive ion focus ~ 40 m downstream of IP

Longitudinal Double-Spin Asymmetry

$$\vec{D}(\vec{e}, e' p_S) X$$

- $t = (P_D - p_S)^2$
 $t \sim M^2 - |p_S^{Rest}|^2 - 2MB_D$
 - On-shell neutron: $t = M^2$
- $A_{||}$ insensitive to D-state, FSI for $M^2 - t < 0.04 \text{ GeV}^2$
 - High Resolution and High Luminosity for fine binning
- $\alpha_S(Q^2)$ from Bjorken sum Rule.
- ΔG from Evolution
- Extensions to *e.g.* $D(e, e' \gamma pn)$



The importance of Variable Beam Energies

$$A_{||} = \frac{d\sigma(++)+d\sigma(--)-d\sigma(+)-d\sigma(-)}{d\sigma(++)+d\sigma(--)+d\sigma(+)+d\sigma(-)}$$

$$= D \frac{g_{1n}}{F_{1n}} + \dots$$

$$D = \frac{y(2-y)}{2-2y+y^2} \quad \text{Depolarization factor}$$

$$y = \frac{Q^2}{x_{Bj}(s_{eN} - M^2)}$$

- Optimal to run at lowest practical beam energy
- $FOM \sim \mathcal{L} (P_e P_D A_{||})^2$

$$\vec{D}(\vec{e}, e', p_S) X$$

