



New data in transverse beam asymmetries

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Aims

Advertise new transverse asymmetry results.

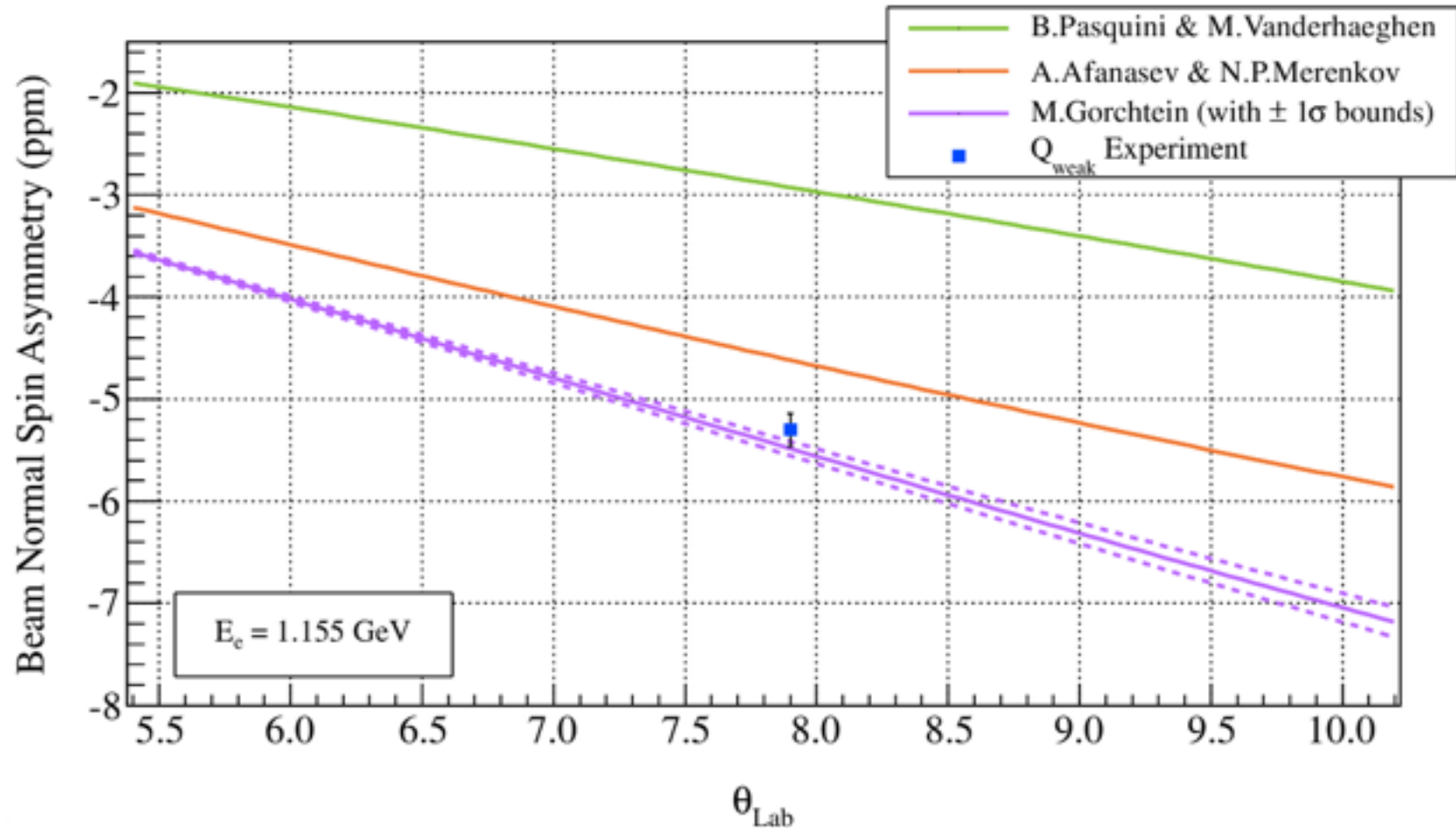
Solicit new or improved calculations.

Hydrogen Elastic Transverse

Preliminary data released at CIPANP 12.

Very precise result, $\sim 3\%$ uncertainty.

Publication currently being drafted.



Nuclei Elastic Transverse

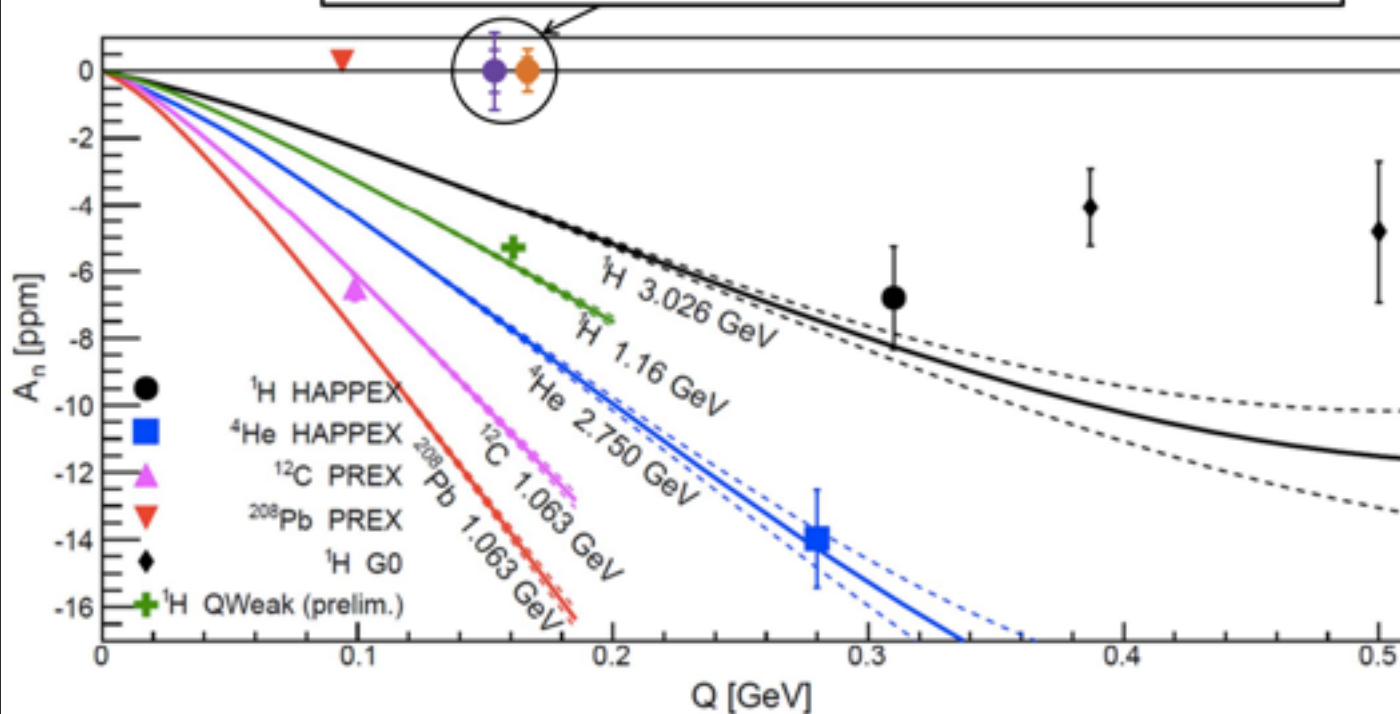
Qweak will produce new transverse asymmetries for ^{12}C and ^{27}Al nuclei.

Sits in the gap between ^{12}C and ^{208}Pb .

$E = 1165 \text{ MeV}$, $Q^2 = 0.025 \text{ GeV}^2$

Preliminary Qweak error estimates - displayed at $A_n = 0$
 Inner error: statistical; Outer error: conservative total error

^{12}C ● ^{27}Al ●



Calculations are under control except ^{27}Al is not spin-parity 0^+ ($5/2^+$).

PhysRevLett.109.192501
 Gorchtein calculations

Inelastic (resonance region)

Inelastic transverse asymmetries from ^1H , ^{12}C and ^{27}Al at Delta resonance.

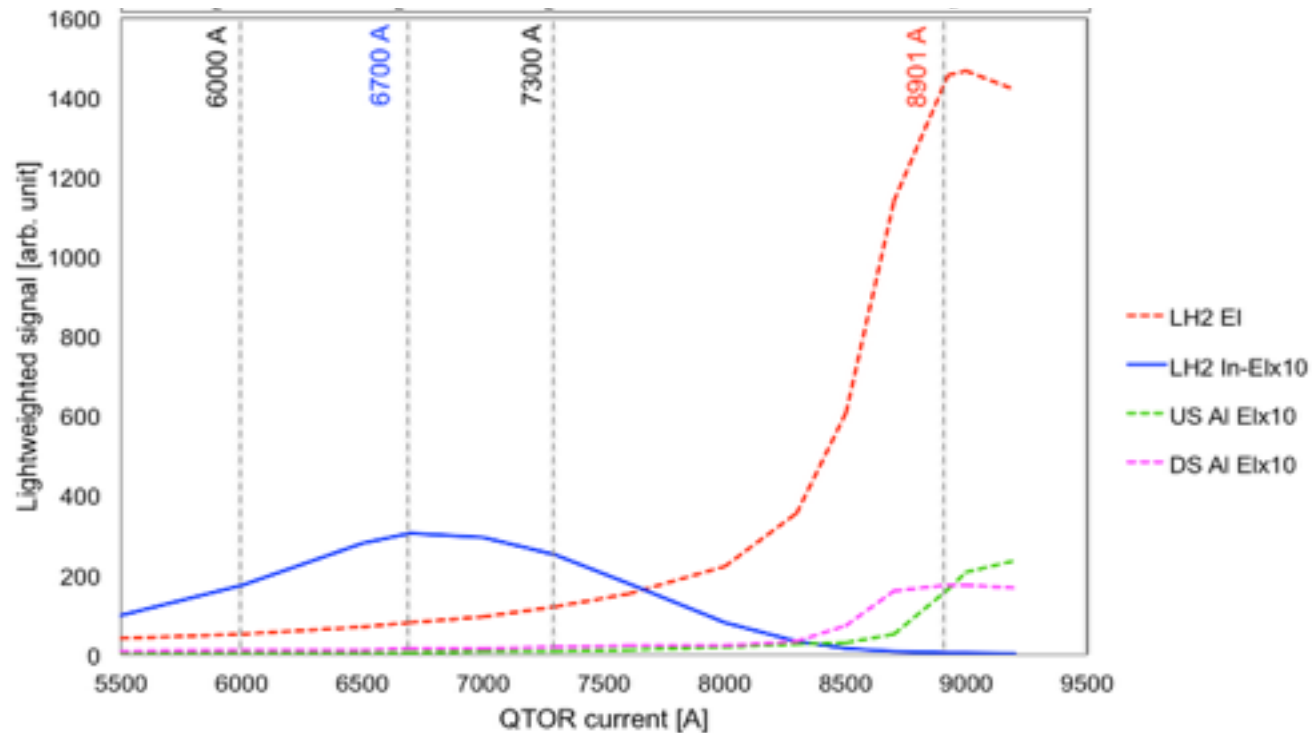
How to interpret this data?

Time reversal symmetry arguments no longer hold.

Interpretation proportional to 2-gamma exchange is no longer valid.

Uncertainty is dominated by the separation of elastic and inelastic signals.

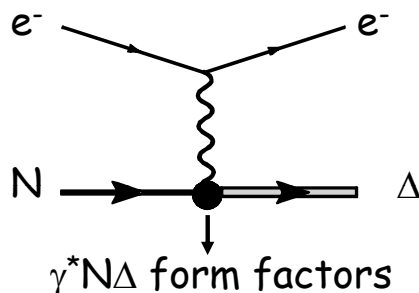
Expect ~20% uncertainty for ^1H .



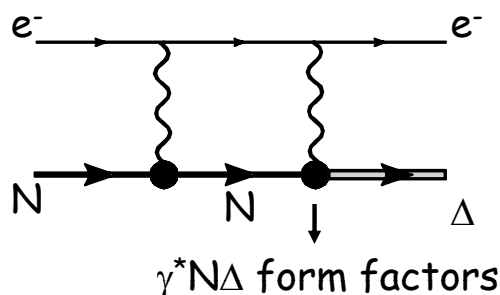
Beam Spin Asymmetry in inelastic eN scattering with Δ in the final state

$$B_n = \frac{\text{Im}(T_{f1}^{*1\gamma} \text{Abs}T_{fi}^{2\gamma})}{|T_{fi}^{1\gamma}|^2}$$

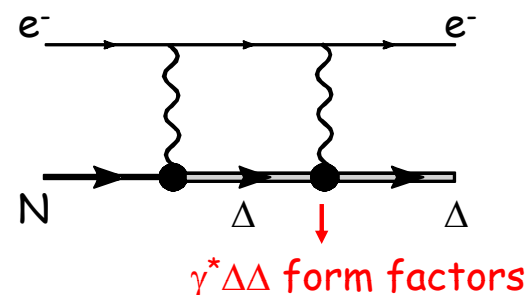
➤ 1γ exchange



➤ 2γ exchange



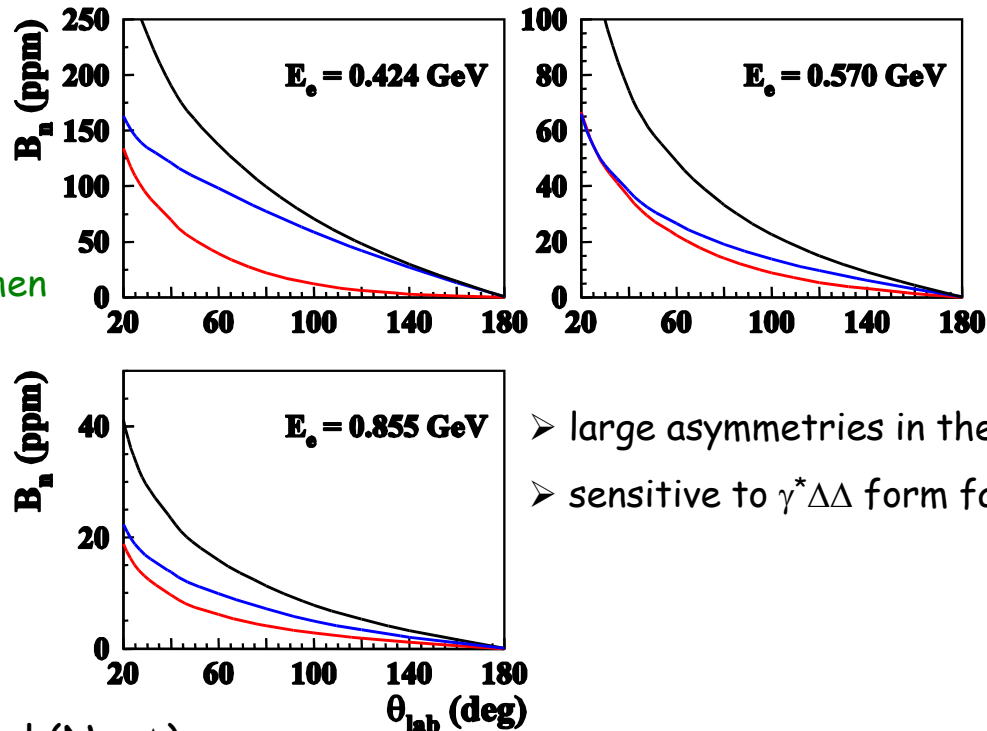
for $s^* M_\Delta^2$



unique tool to learn about the $\gamma^*\Delta\Delta$ form factors

Beam asymmetry in inelastic electron scattering

B.P. & Vanderhaeghen
in preparation



- large asymmetries in the forward region
- sensitive to $\gamma^* \Delta \Delta$ form factors

— total (N + Δ)

— Δ intermediate state

— N intermediate state

$\gamma^* \Delta \Delta$ form factors from LATTICE QCD
Alexandrou et al., arXiv:0901.3457 [hep-ph]

$\gamma^* N \Delta$ form factors
from MAID07 parametrization

Barbara Pasquini, MAMI and Beyond, 30 March-3 April 2009

<http://wwwkph.kph.uni-mainz.de/T//MAMIIandBeyond/02%20Dienstag/08%20Pasquini.pdf>

Non-resonant Inelastic

$E = 3350 \text{ MeV}$, $Q^2 = 0.08 \text{ GeV}^2$, $W = 2.23 \text{ GeV}$

Transverse asymmetry in electron scattering to 40%

Transverse asymmetry in pion production to 30% (dominated by photo-production.)

PVDIS

Transverse asymmetry in electron DIS at $Q^2 = 1.09$ to 60%

Summary

New transverse asymmetry results from the Qweak experiment will be available in the next couple of years.

New calculations are needed, to interpret these data, for transverse asymmetry:

Delta production from Hydrogen, Carbon and Aluminum

Inelastic electron scattering at $W=2.23$ GeV