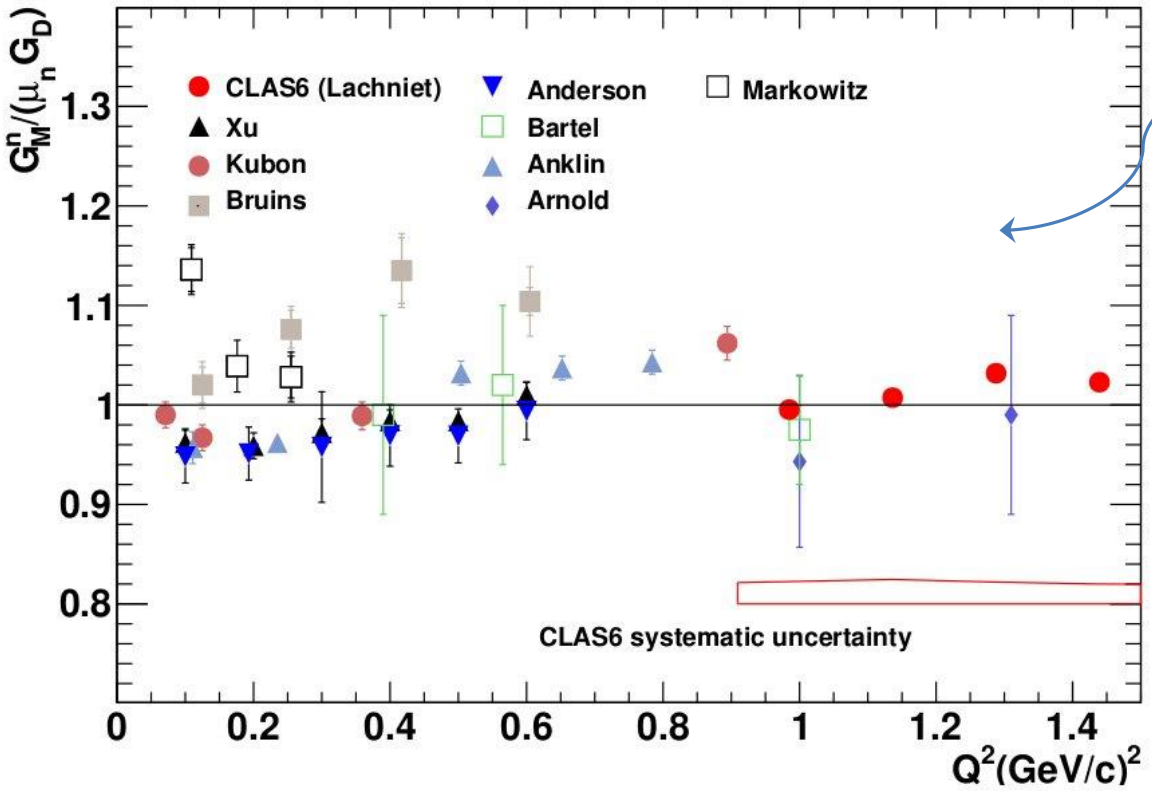
Tension in low-Q^2 G_M^n measurements



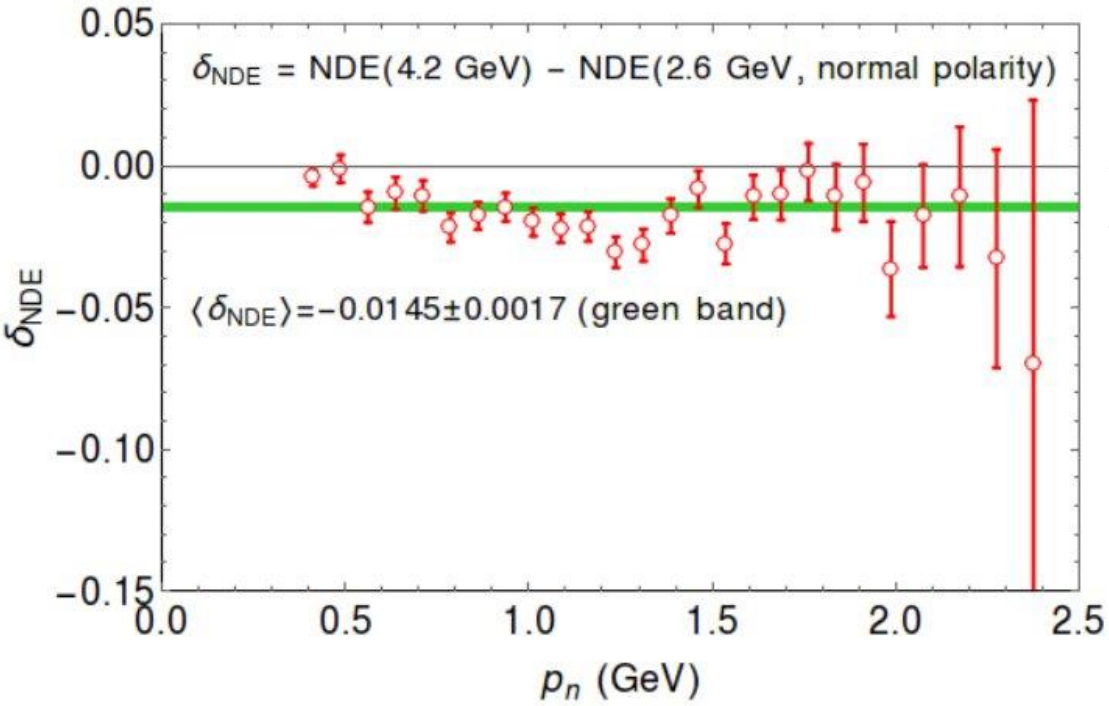
Large systematic uncertainties among neutron detection efficiency (NDE) measurements from different labs and methods.

Experiments used ratio method unless noted otherwise.

Author	Reference	NDE Method	Author	Reference	NDE Method
Lachniet	PRL 102, 192001 (2009)	^{1}H(e, e$'\pi^+$n)	Anderson[1]	PRC 75, 034003 (2007)	NA
Xu[1]	PRC 67, 012201 (2003)	NA	Bartel	NP B58, 429 (1973)	^{1}H(γ, π^+n)
Kubon	PLB 524, 26 (2002)	^{1}H(n, p)n	Anklin	PLB 336, 313 (1998)	^{1}H(n, p)n
Arnold[2]	PRL 61, 806 (1988)	NA	Anklin	PLB 426, 248 (1998)	^{1}H(n, p)n
Bruins	PRL 75, 21 (1995)	^{1}H(γ, π^+)n	Markowitz[3]	PRC 48, R5, (1993)	^{2}H(γ, np)

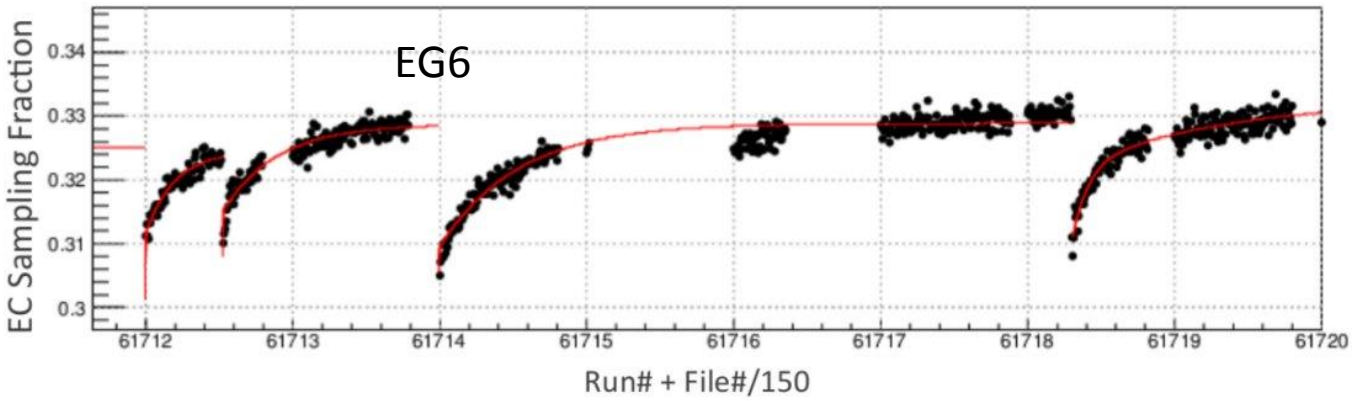
1 - $^3\vec{\text{He}}(\vec{e}, e')$ 2 - ^{2}H(e, e$'$) 3 - ^{2}H(e, e$'$n)

CLAS6 Results



Difference between E5 (CLAS6 G_M^n experiment) measurements of NDE vary by 1.5% which is about twice the expectation for the CLAS12 G_M^n experiment.

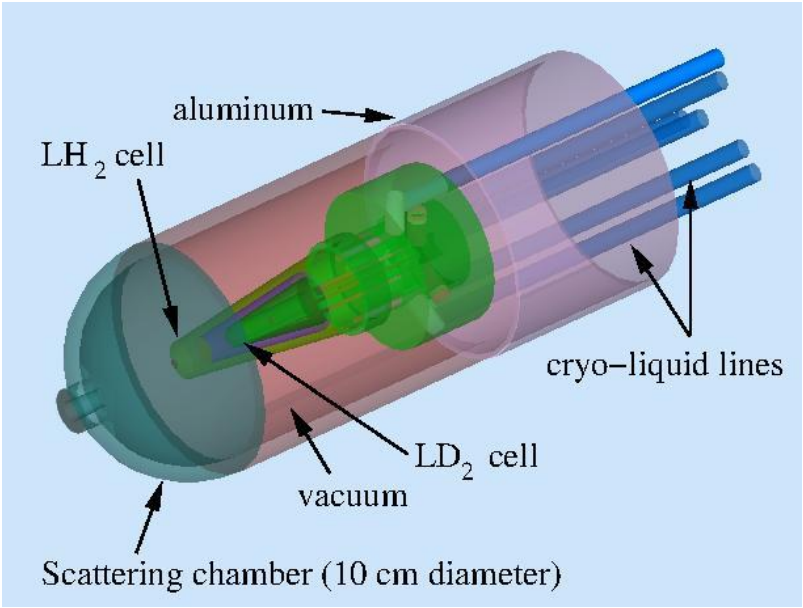
The EC is used to measure NDE. It's response to charged particles can vary significantly with time and conditions creating differences across run periods.

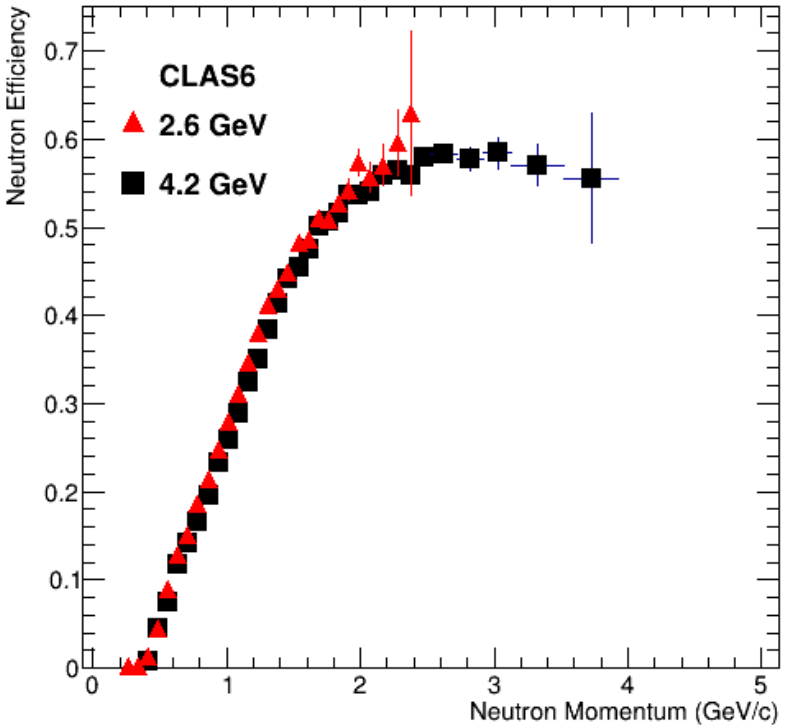


https://clasweb.jlab.org/rungroups/lowq/wiki/index.php/EG6_EC_Sampling_Fraction_Time-Dependence_Correction

CLAS12 G_M^n Target Simulation

- Modeled after E5 target used in CLAS6 G_M^n measurement.
- Dual target with two, 2-cm cells containing LH2 and LD2.
- Cells separated by 1-cm gap.
- Enables us to perform *in situ* calibrations.





- Results of CLAS6 G_M^n neutron detection efficiency measurement.
- Two beam energies – see previous slide for comparison of values.