^{3}He Collaboration Meeting

Measurement of A_x and A_z Asymmetries in the quasi-elastic $^3\vec{He}(\vec{e},e'd)$ reaction

prsented by

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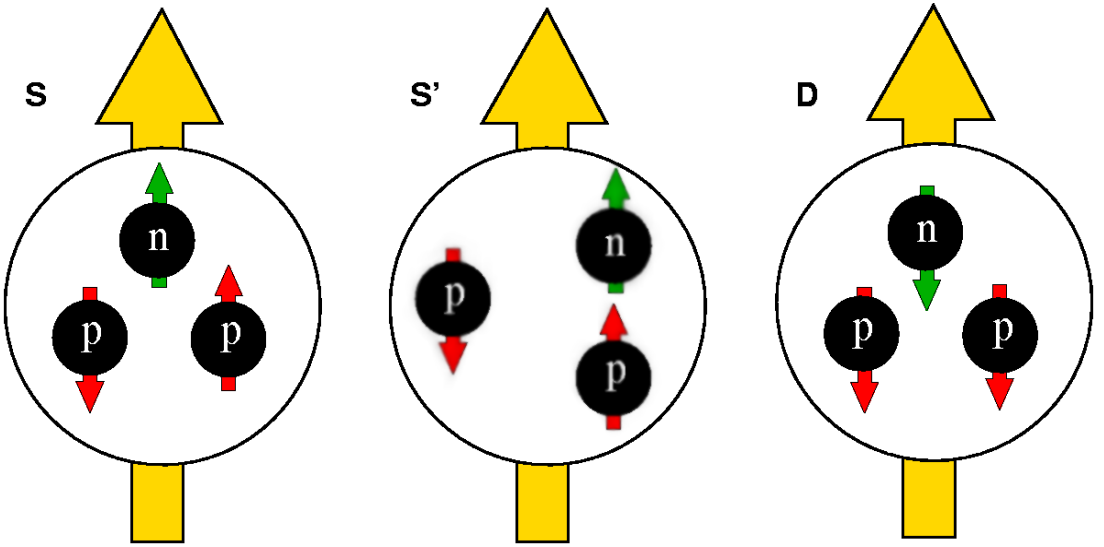
Main Physics Goals

- *General:* Achieve a better understanding of the ground-state spin structure of ^{3}He, i.e. improve our understanding of ^{3}He rather than using it as an effective neutron target.
- *Specific:* Test state-of-the-art Faddeev calculations and use these calculations to gain a better understanding of the dynamics and the S' and D wave-function components of ^{3}He.

This is accomplished by making precision measurements of the double polarized ^{3}He(e,e'd) reaction.

- *Impact*: All experiments using ^{3}He as a polarized neutron target.

Ground State of ^{3}He



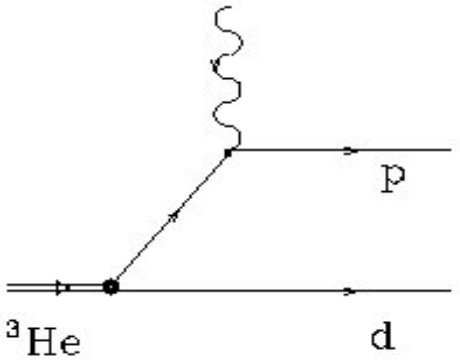
- S spatially symmetric, 90% of spin-averaged WF, “neutron target”
- D generated by tensor component of NN force, 8.5%
- S' mixed-symmetry configuration, 1.5%

As a function of missing momentum, these relative contributions can affect the (e,e'N) reaction differently.

e.g. the NIKHEF $\vec{D}(\vec{e},e'p)$ results: PRL 89 (2002) 102302

Why detect the quasi-elastic Deuteron?

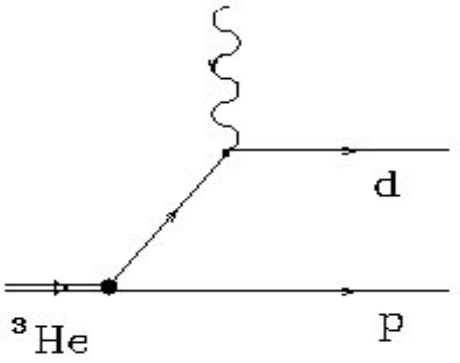
$^3He(e,e'p)$



(a)

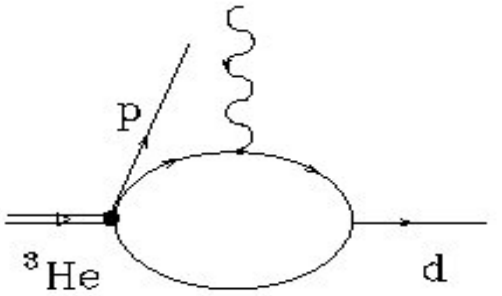
$\omega = q^2/2M_p$

$^3He(e,e'd)$



(b)

Isoscalar



(c)

Isovector

$\omega = q^2/2M_d$

Unique isoscalar-isovector interference in $^3\vec{He}(\vec{e},e'd)$

Experiment Collaboration

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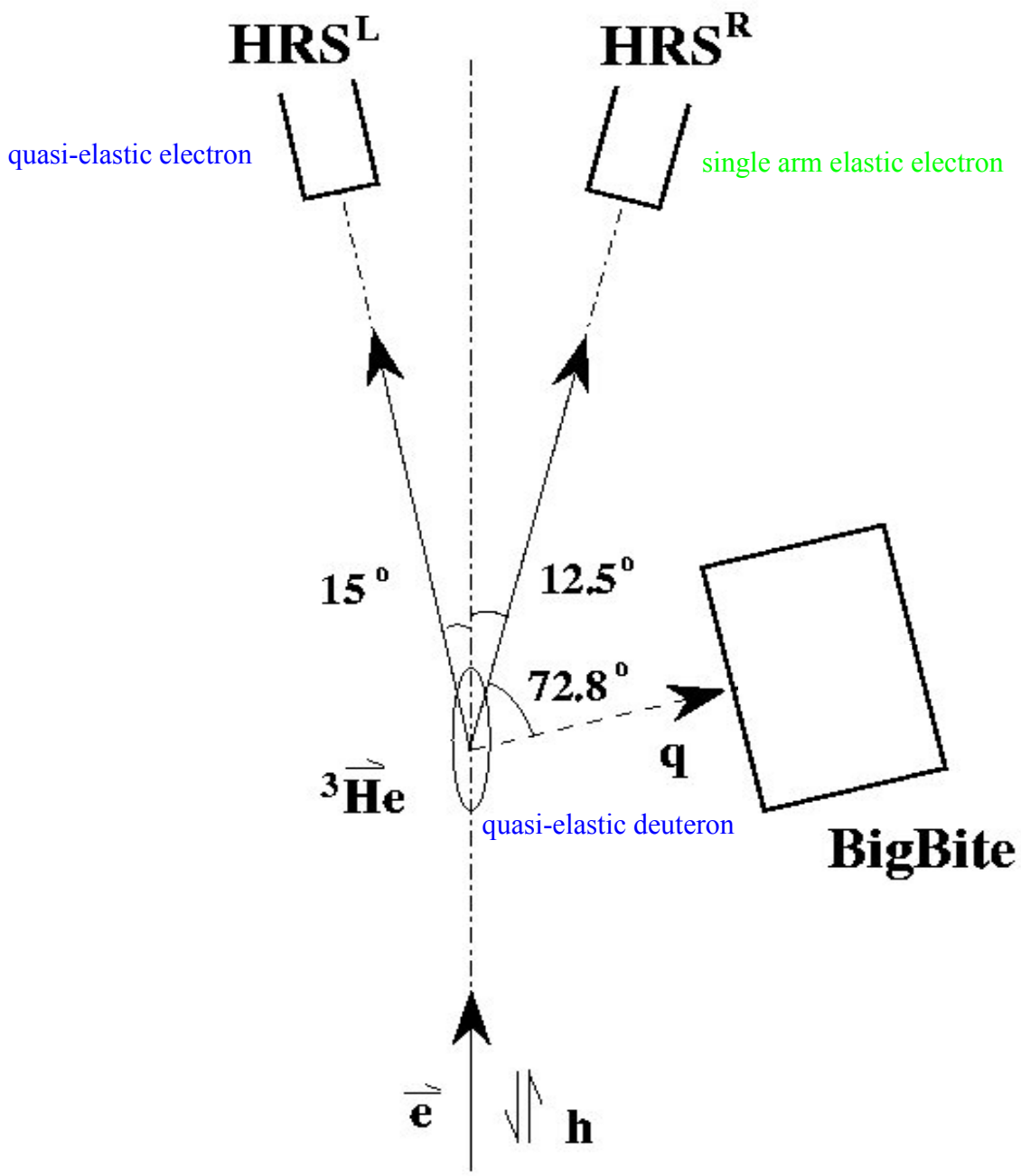
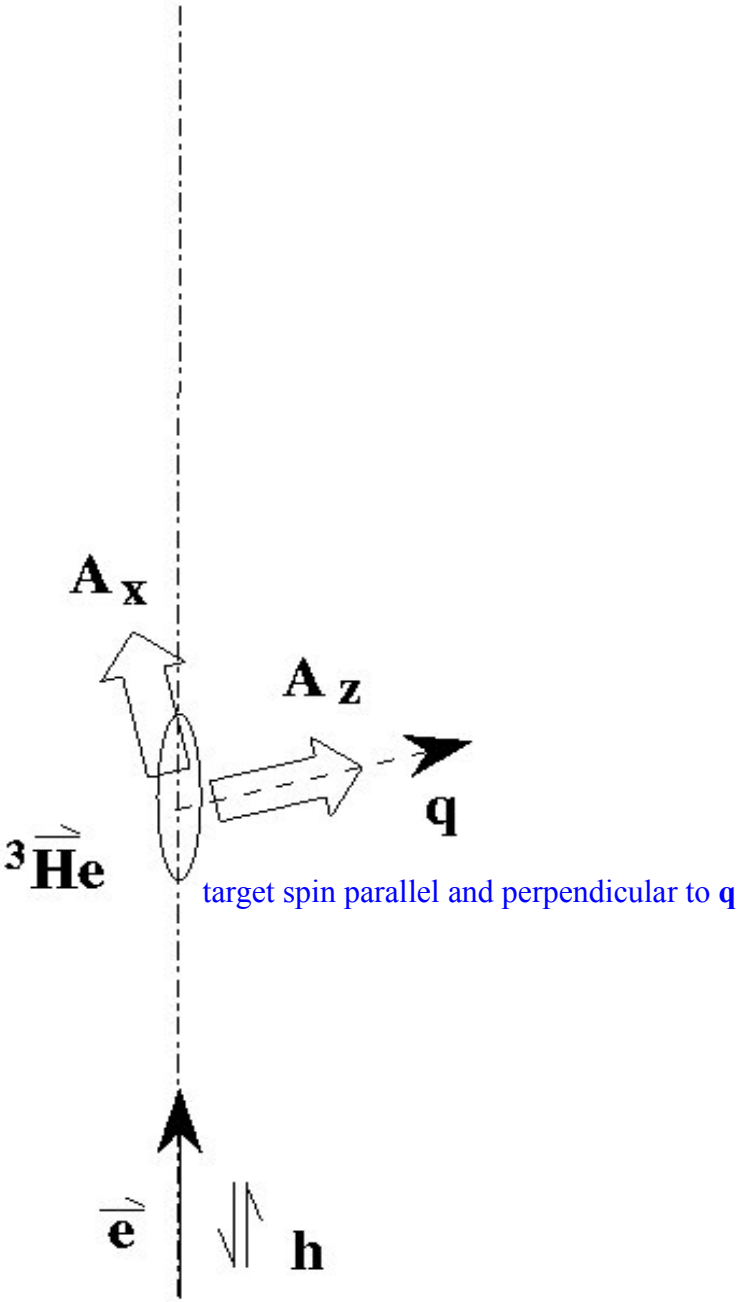
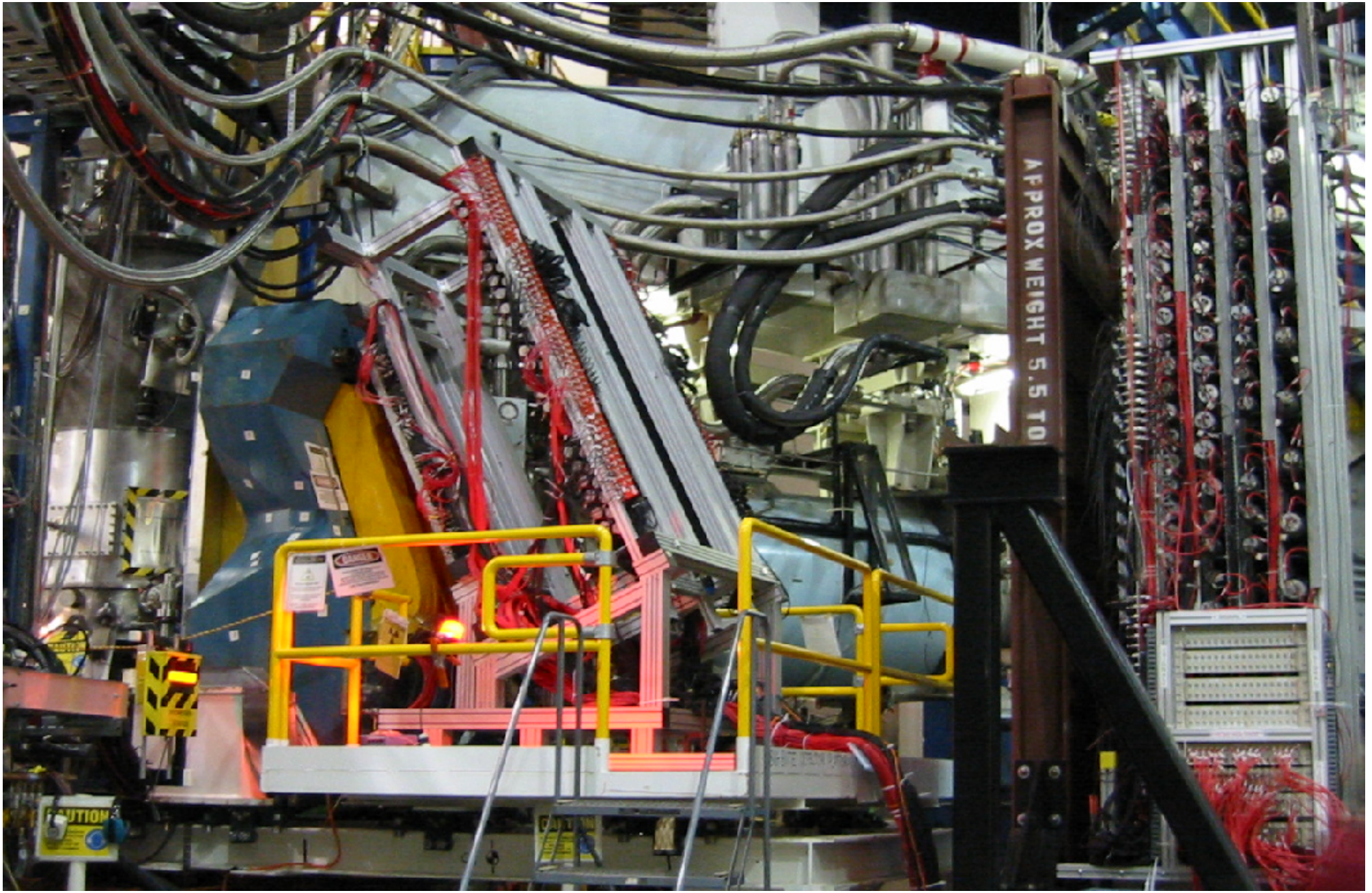
The Hall A Collaboration

Sketch of Experiment



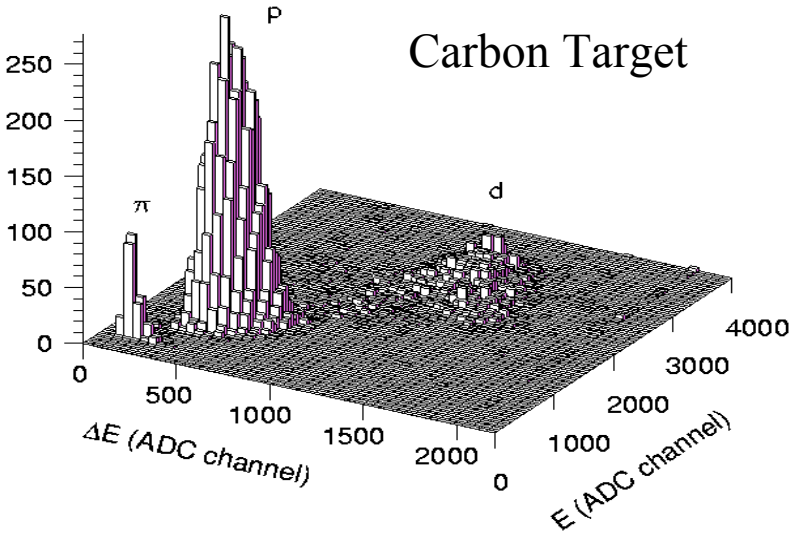


BigBite Spectrometer During SRC Experiment

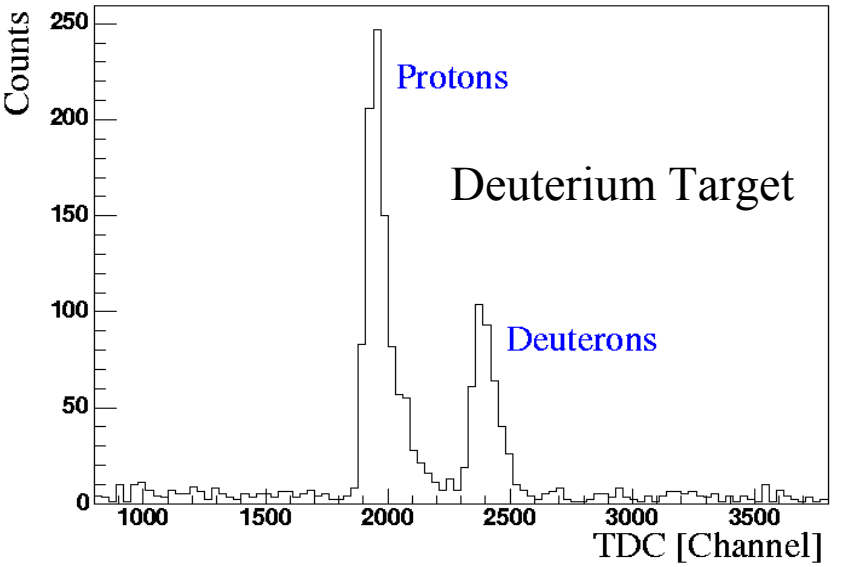


Scintillator Planes

Trigger detector consists of 3mm and 30mm scintillator planes.

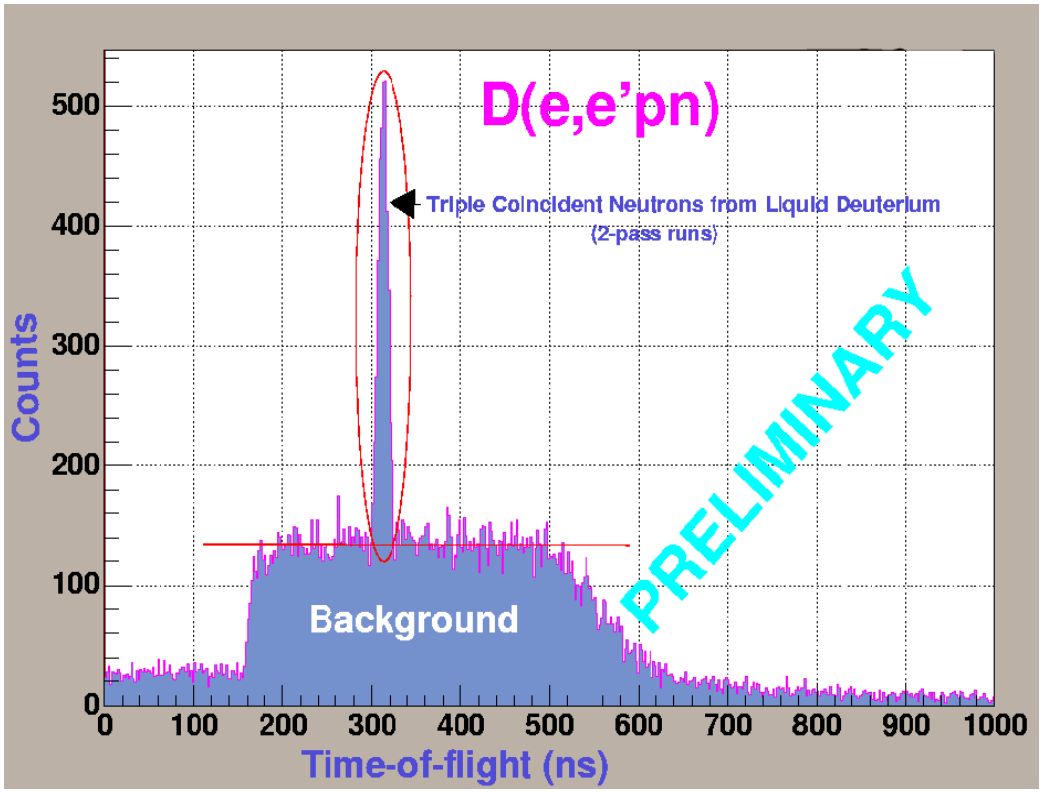


- Tested at a Luminosity of 10^{37}
- 70^{o} and 2.2. GeV beam
- Almost identical to our 72.8^{o} and 2.4 GeV beam
- Wire-chambers are built and have been tested in the Hall.



HAND

- Hall A Neutron Detector
- Fully Assembled
- Needs Cabling and Testing



Summary of Needs

- **Target Spin Angles of 15 degrees from nominal.**
- **New detector frame.** Either just for this experiment or for the entire family of experiments. We will decide together what is most convenient solution.
- **Neutron detector** needs patch panels re-cabled and all signals tested.
- **Scintillator planes** needs to be prepared for a new frame.
- Planing to just use **two wire-chambers** to minimize material.
- All experiments could make use of a chamber in-front of BigBite for special low luminousity theta and phi **optics calibration**. This was done very successfully at NIKHEF.
- Due to the limited time between experiments**, DAQ** system needs to be well planned. With the exception of VME equipment, we have plenty of electronics. We will need **several hundred new cables**.