Upcoming *Hall A* EMC & SRC Experiments

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a.k.a. How I Learned To Stop Worrying And Love The Triton

Please Start Thinking!

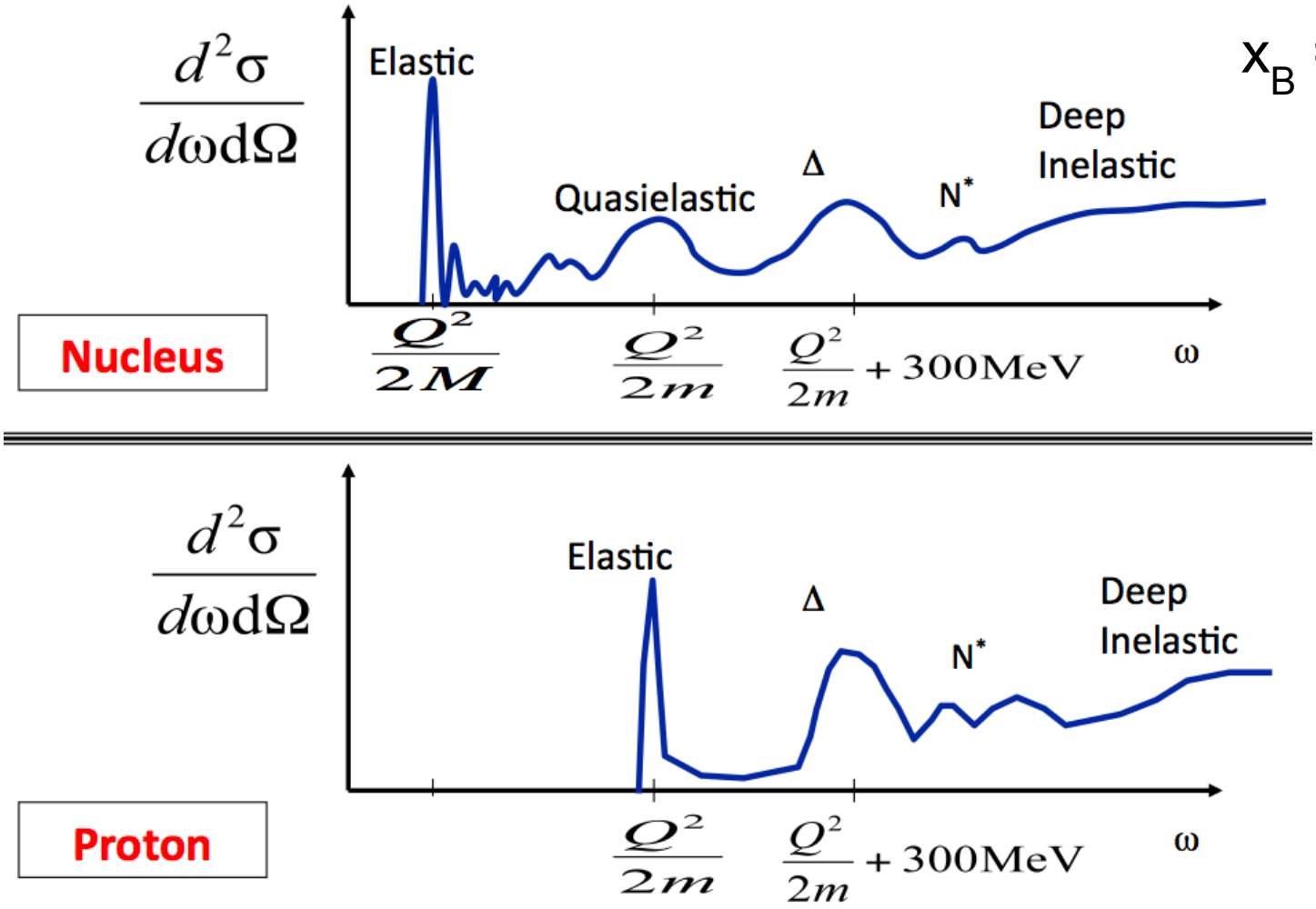
Hall A will install a tritium target.

Hall A will not likely do it again.

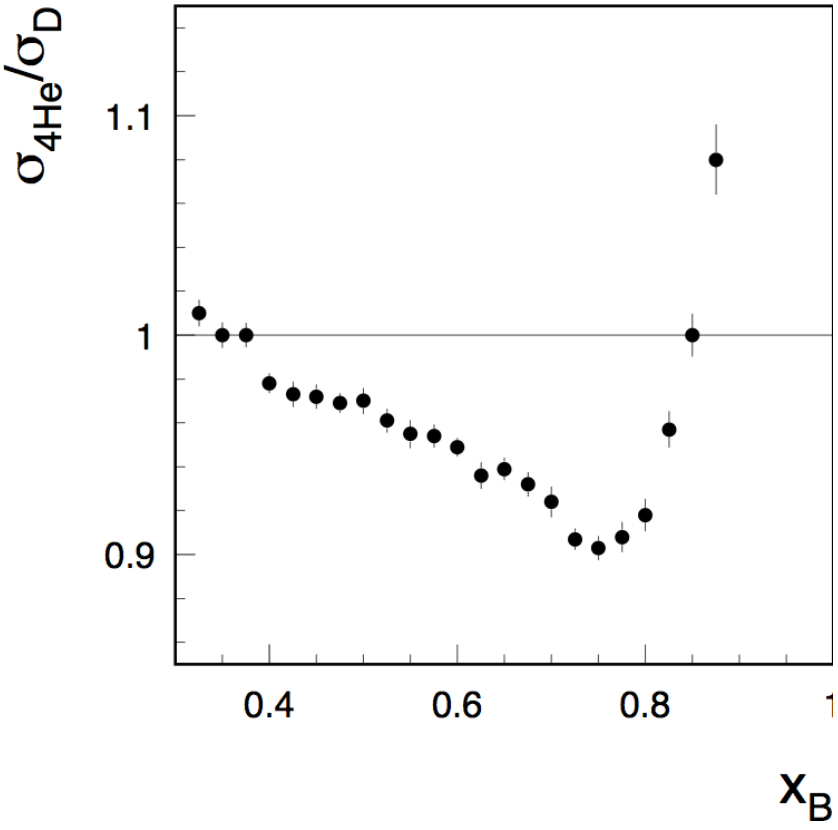
IF there is another tritium experiment we should be doing (beyond what I will present today); we need to work on it ASAP!

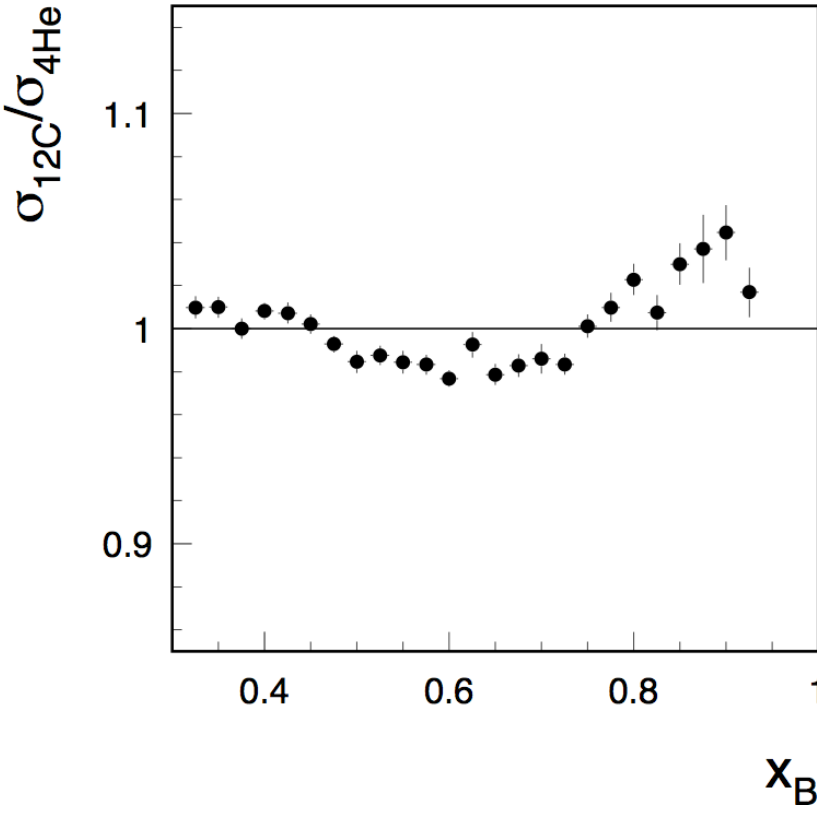
A(e,e') at Fixed Q^2

$x_B = Q^2/2mw$



EMC Effect Ratios





where x_B is simply $Q^2/2m_p$(e-e') [and yes Mark I will remake them with $AQ^2/2m_A$(e-e') for next time]

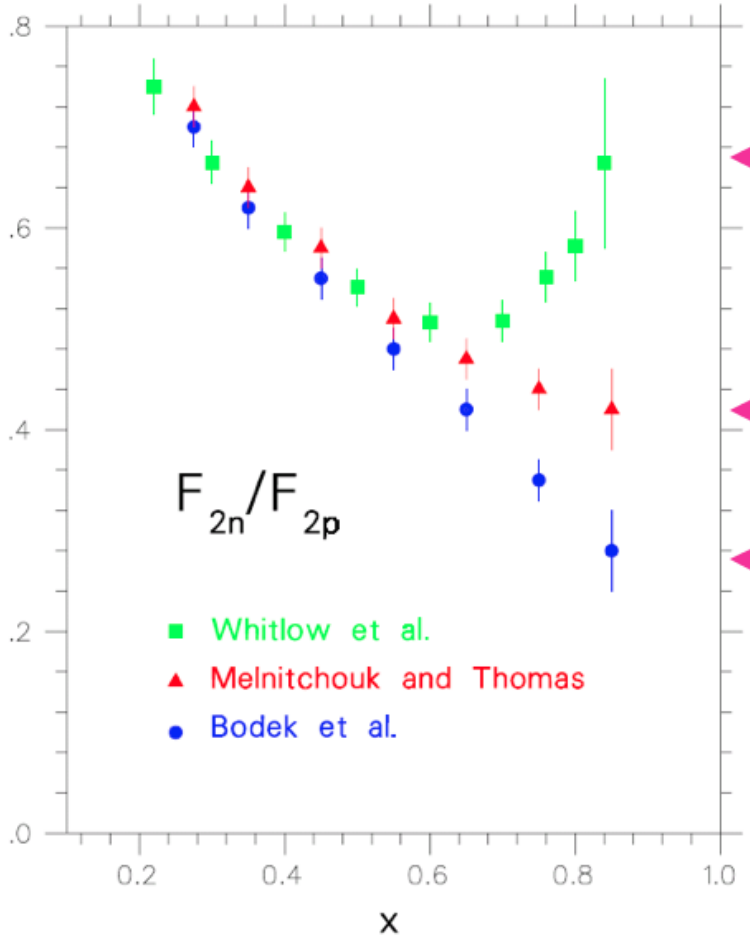
The Neutron Problem

Without free neutron targets, scientist mostly use deuteron or 3He targets to extract information about the neutron.

SO, unlike F2p, F2n requires models.

F2d **DOES NOT EQUAL** F2p + F2n

as x goes to 1 extraction variation grows rapidly



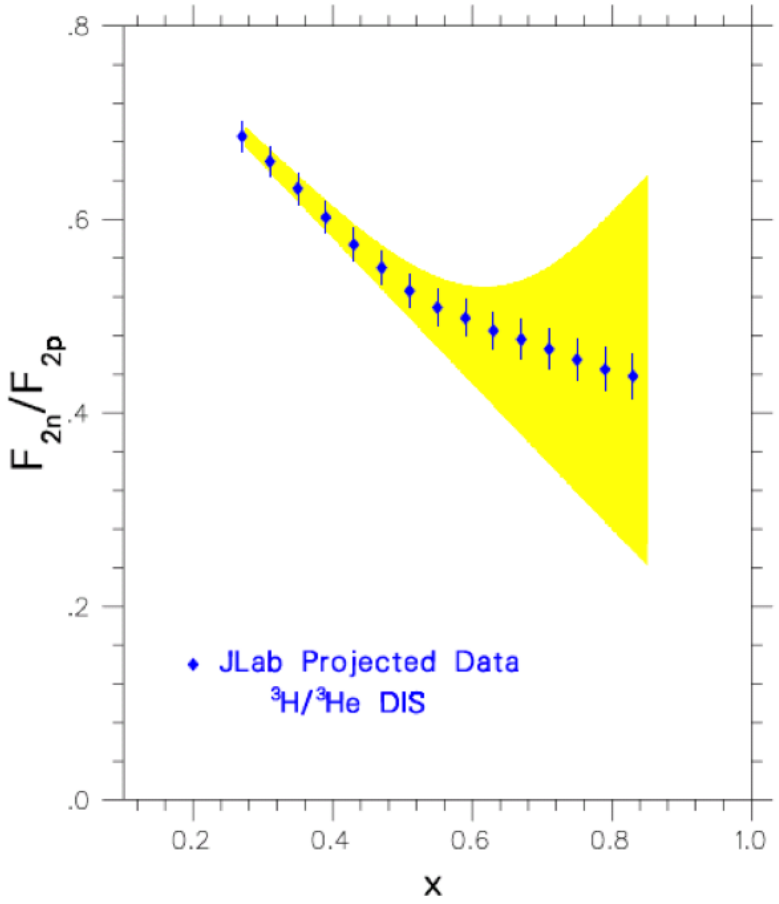
SU(6) symmetry

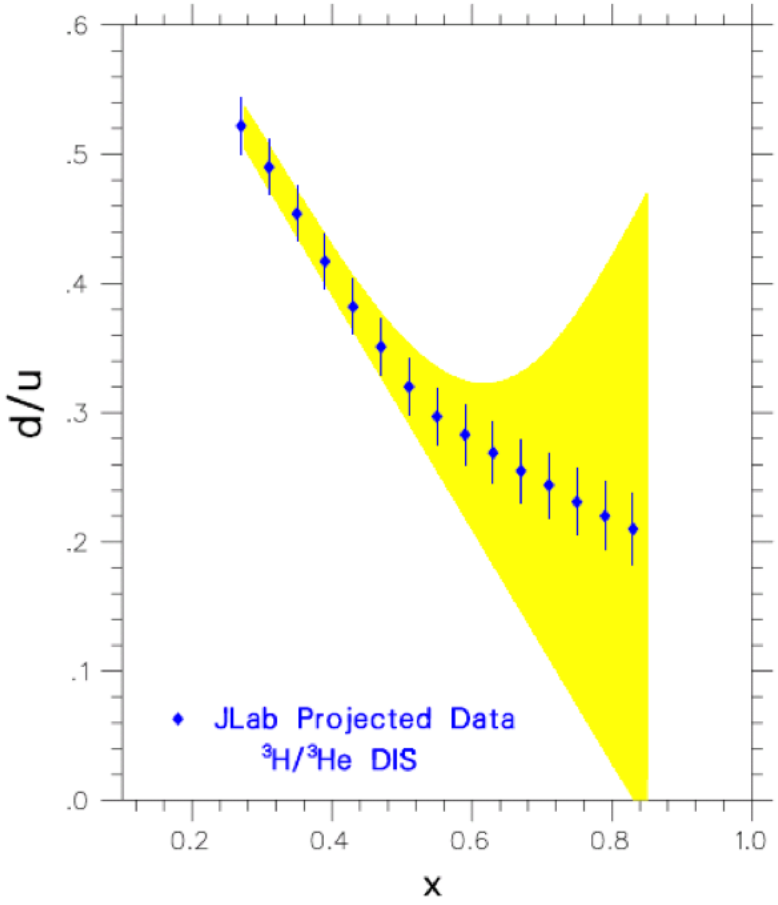
pQCD

Scalar di-quark

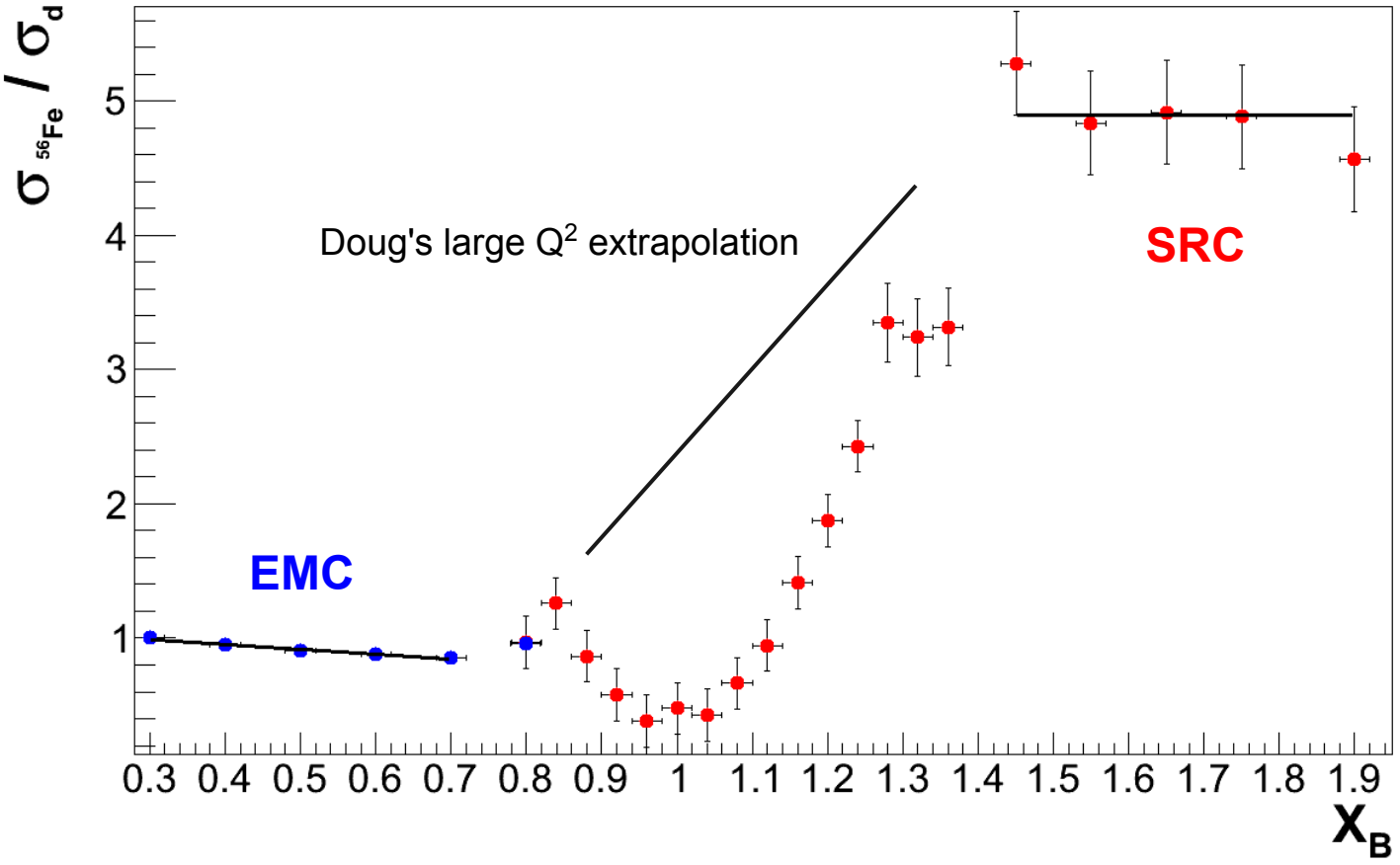
Reviews: N. Isgur, PRD 59 (1999),
S Brodsky et al NP B441 (1995),
W. Melnitchouk and A. Thomas PL B377 (1996) 11.

Triton Cross Section Ratios

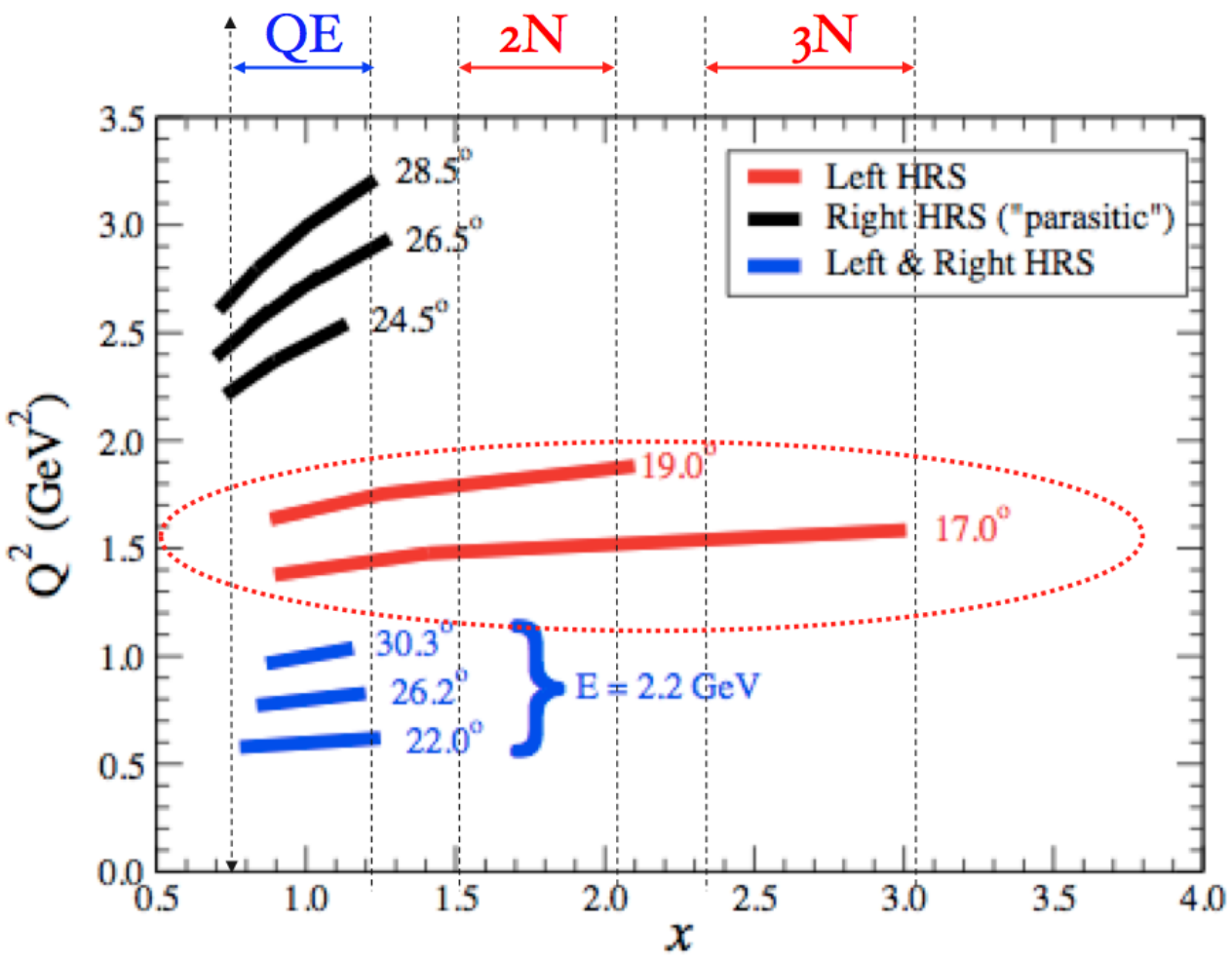




Full EMC and SRC Range



Tentative Kinematic Coverage



x > 1 Cross Section Ratios

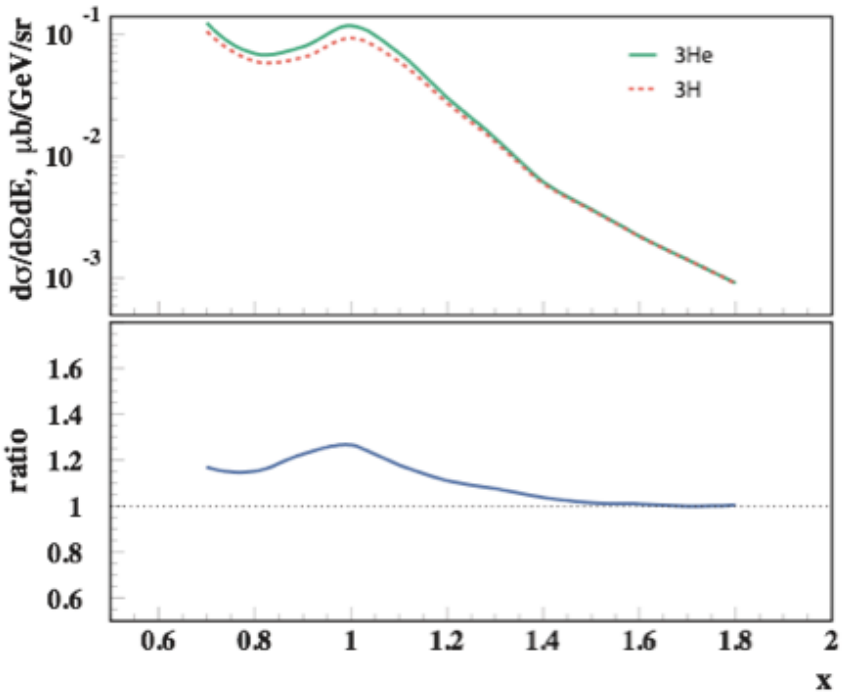
Isospin independent:

$$\frac{\sigma_{^3He}/3}{\sigma_{^3H}/3} = \frac{(2\sigma_p + 1\sigma_n)/3}{(1\sigma_p + 2\sigma_n)/3} \xrightarrow{\sigma_p \approx 3\sigma_n} 1.40$$

n-p (T=0) dominance:

$$\frac{\sigma_{^3H}/3}{\sigma_{^3He}/3} = \frac{(2pn + 1\cancel{nn})/3}{(2pn + 1\cancel{pp})/3} = 1.0$$

Inclusive cross section calculation from M. Sargsian using AV18/UIX



Safety and Tritium Targets

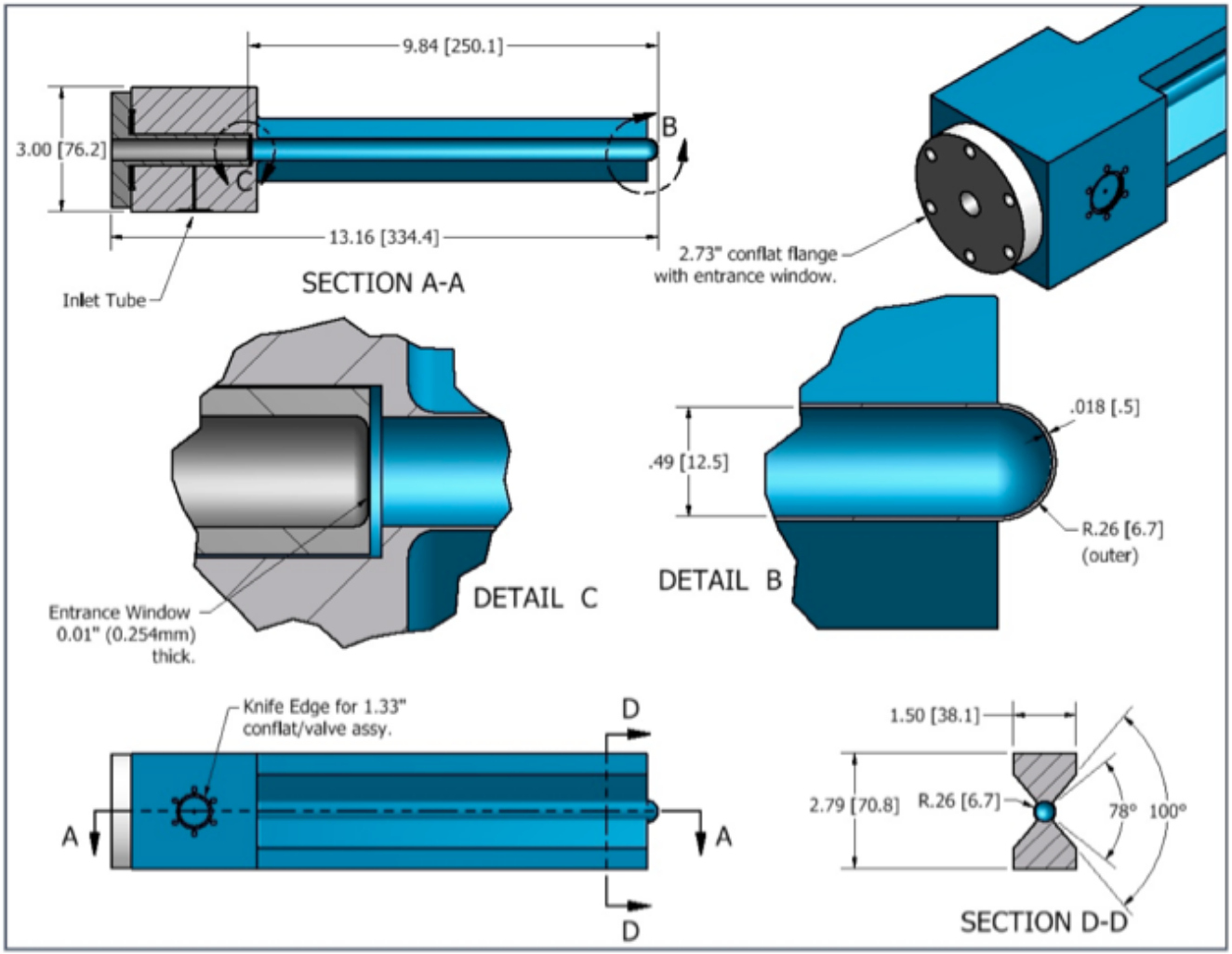
The experiments will be using an extremely thin tritium target.

Cell will only hold 200 psi tritium.

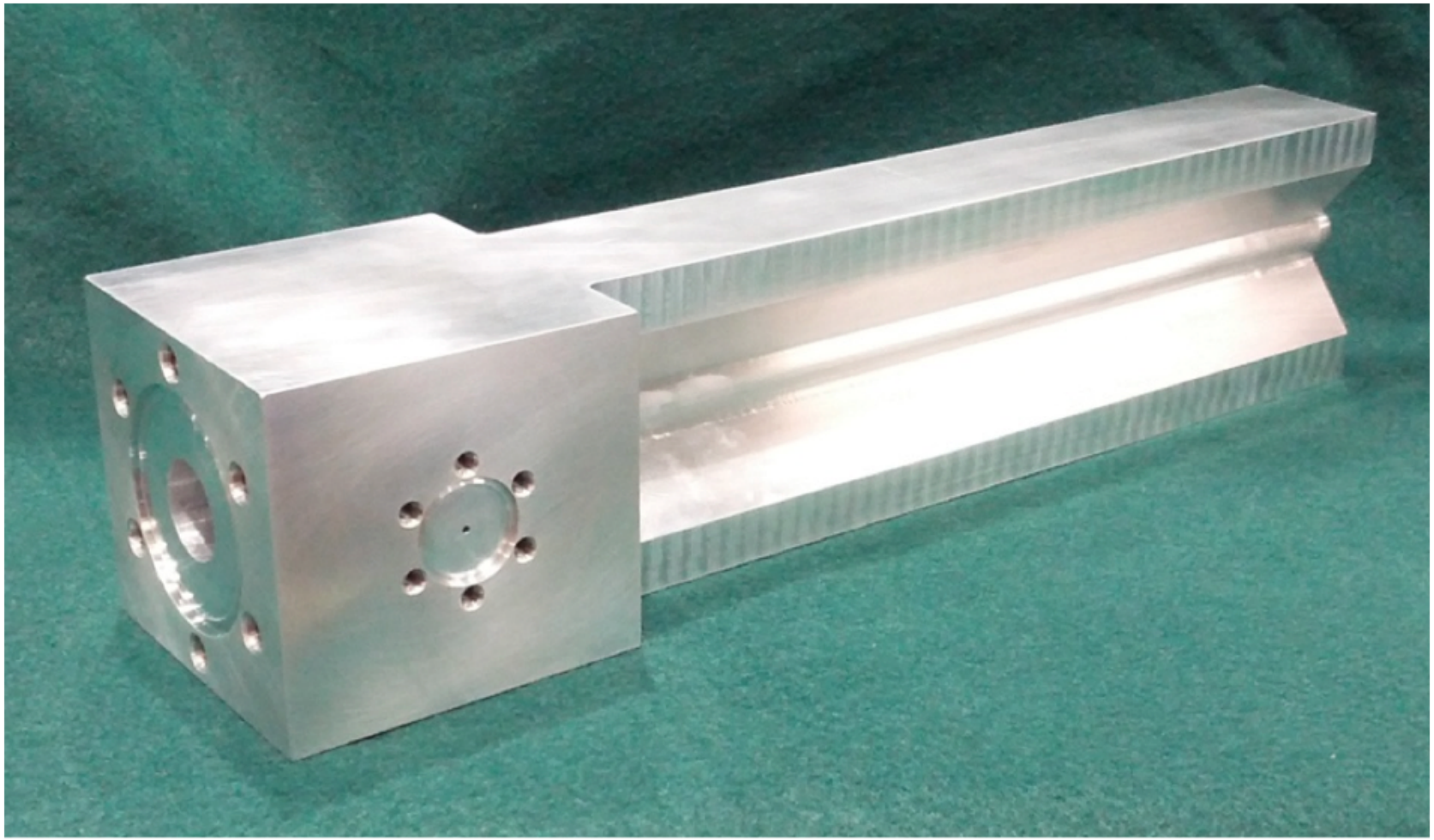
3.2 mg/cm^3 and ~20cm long; **only 1 kCi**

MUCH less tritium than previous experiments.

Target Machined from a Single Block of Aluminium



Prototype Tritium Cell



Summary Of Triton Exp.

Hall A will cover $0.3 < x_B < 1.8$ for:

- Hydrogen
- Deuterium
- Tritium
- 3He
- Aluminum (i.e. an empty cell)

This data will allow a straightforward extraction of F2n/F2p and d/u while also providing data to check the few-body physics is properly understood.

For More Details

http://hallaweb.jlab.org/12GeV

E12-11-112: Precision measurement of the isospin dependence in the 2N and 3N short range correlation region. Spokespersons: Arrington, Day, DH, Slovingon,

E12-10-103: Measurement of the F2n/F2p, d/u Ratios and A=3 EMC Effect in Deep Inelastic Scattering off the Tritium and Helium Mirror Nuclei. Spokespersons: Annand, Petratos, Holt, Gomez, Ransome

Hall C EMC and SRC

Will run with the following set of targets:

H, D, 3He, 4He, 6Li, 7Li, **9Be**, 10B, 11B,**12C**, 40Ca, 48Ca, **63Cu, Au (**EMC only**, SRC only, BOTH)**

NOTE: This is being updated and likely will end up being the same targets for both.

SRC proposal E12-06-015 and EMC proposal E12-10-008

NOTE: We just bought some depleted Uranium-238 for an experiment at Duke. That is the heaviest material we can easily obtain. (www.goodfellow.com for example).

Discussion

Is there another Triton experiment we should be proposing?! Should we be looking into a heavy target extension to the Hall C program?

For tritium in particular, luminosity will be low.

- Elastic scattering noted by J. Arrington
- Ratio of (e,e'p) for ~300 MeV/c
- CSR noted by R. Ent