

1. E12-10-002: Overview

❑ Extend proton and deuteron F_2 structure function precision measurements to larger x and Q^2 by measuring $H(e,e')$ and $D(e,e')$ cross sections in the resonance region and beyond up to $Q^2 \sim 17$ GeV^2 and $x \sim 0.99$

Need precision data on proton and deuteron F_2 at large x to:

❑ constrain PDFs at large x

- PDFs: fundamental characterization of nucleon structure in QCD \rightarrow need well constrained PDFs across x

- distinguish different mechanisms of spin-flavor symmetry breaking (d/u at large x)
BONUS/Hall B (E12-06-113) $\rightarrow F_2^n/F_2^d$
Hall C E12-10-002 \rightarrow precision F_2^p/F_2^d in same kinematic region

\rightarrow New Milestone HP13 by 2018

“Extract accurate information on spin-dependent and spin-averaged valence quark distributions to momentum fractions x above 60% of the full nucleon momentum”

❑ *extend* studies of local quark-hadron duality in proton and neutron F_2

1. E12-10-002: Overview

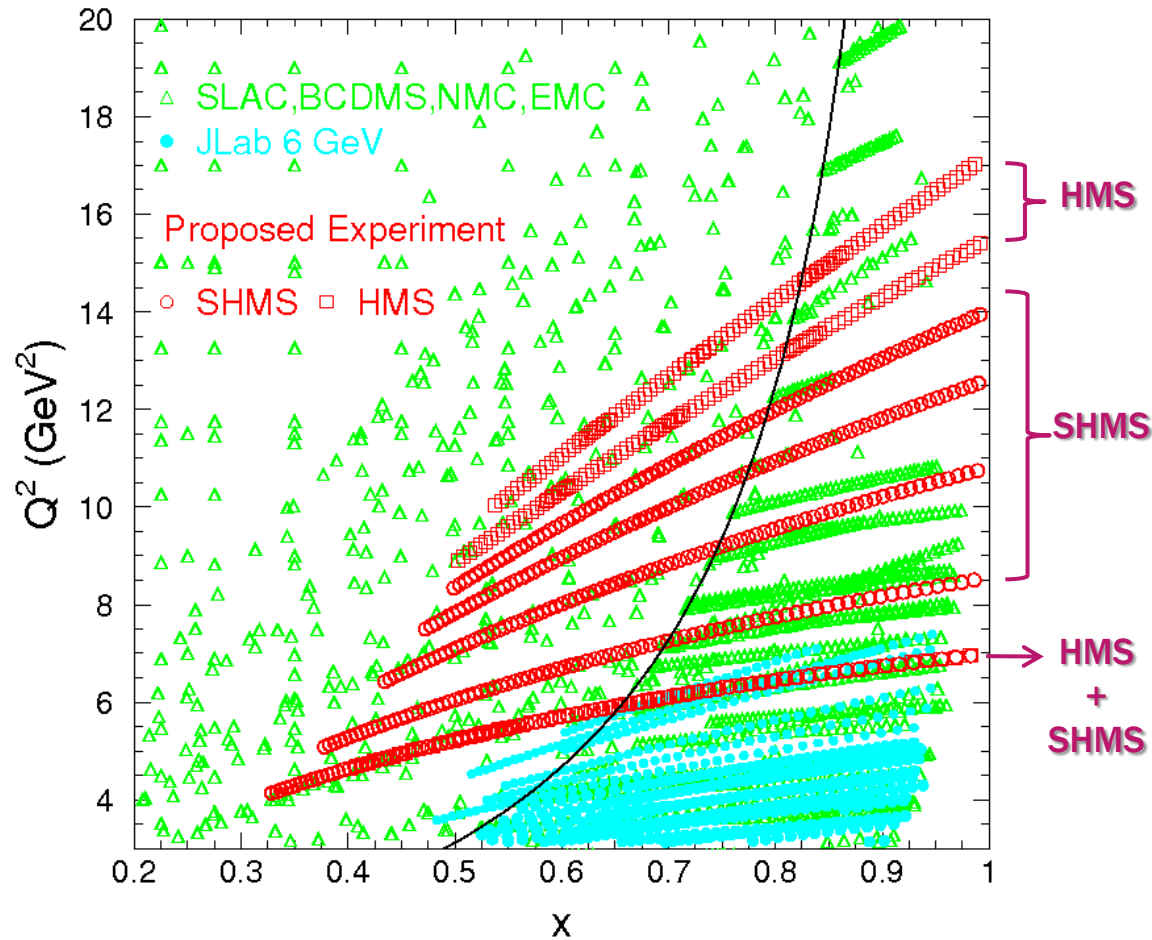
□ Straightforward extension of Hall C experiment E00-116:

S.P. Malace *et al.*, Phys. Rev. C 80 035207 (2009)

S.P. Malace *et al.*, Phys. Rev. Lett. 1004 102001 (2010)

For E12-10-002 we need:

- 11 GeV beam (+ 6.6 GeV for systematic measurements)
- 10 cm Hydrogen and Deuterium cryogenic targets (+ Al for background measurements)
- SHMS and HMS (overlapping scans planned with both spectrometers)



would like to run as commissioning experiment

2. E12-10-002: Collaboration Contribution

- Hampton University group is building the drift chambers for the SHMS and may refurbish the HMS chambers? (pending on availability of funds)
- Hampton University group has committed to perform some commissioning and optics studies for the SHMS start
- James Madison University group is building the TOF system for the SHMS (3 planes out of 4)
- The JMU group is part of the team that will write the analysis software for the HMS/SHMS

3. E12-10-002: Collaboration Openness

- We're open

4. E12-10-002: Collaboration Readiness

E12-10-002 collaboration past record demonstrates that we can commission a spectrometer; both the JMU and Hampton groups were part of the team that commissioned HMS/SOS

5. E12-10-002: run with new spectrometer/accelerator

- Inclusive measurement
- Detect electrons (not challenging)
- No beam polarization needed
- No polarized targets needed
- All to be standard equipment – from target to detectors
- Not terribly high precision

Unusual/difficult

- pion background
- 11 GeV beam

6. E12-10-002: benefits to Hall C

□ Experienced collaboration ready to go, assisted in design and planning of SHMS, commissioned HMS, facilitated high precision experiments with the latter – we will make sure SHMS is well understood

7. Summary

□ measure $H(e,e')$ and $D(e,e')$ cross sections in the resonance and DIS regions

We need:

- 11 GeV beam (+ 6.6 GeV for systematic measurements)
 - 10 cm Hydrogen and Deuterium cryogenic targets (+ Al for background measurements)
 - SHMS and HMS
- all standard equipment (from target to detectors)

We have:

- collaboration involved in building the SHMS
- experience with commissioning new spectrometers

would like to run as commissioning experiment