

## Abstract

We propose a study of the quasi-elastic  ${}^3\text{He}(\vec{e}, e'd)p$  reaction in Hall A with the polarized  ${}^3\text{He}$  target in conjunction with the High-Resolution Spectrometers and the large-acceptance BigBite spectrometer. The purpose of this measurement is to test the state-of-the-art Faddeev calculations of the three-body system and to study the  $S'$ -state and D-state contributions to the  ${}^3\text{He}$  ground-state wave-function.

Beam-target asymmetries  $A_x$  and  $A_z$  will be measured in the range of recoil momenta  $p_r$  from 0 to about 200 MeV/c, in both parallel and perpendicular kinematics. At  $p_r \lesssim 70$  MeV/c, the D state will be highly suppressed and the asymmetries will be uniquely sensitive to the interference of the S and  $S'$  states. At larger recoil momenta, the contribution of the D state will be increasingly important. We request 15 days of 2.4 GeV, 12  $\mu\text{A}$  polarized electrons in order to perform this experiment.

This proposal is based on the favorable deferral by PAC 21 (see Appendix A) and the PAC 20 letter of intent report (see Appendix B). This proposal has been endorsed by the Hall A collaboration and has received strong theoretical support from the Bochum and Hannover groups. The requested beam-time has been reduced by limiting the experiment to one position of the BigBite spectrometer. While this means a slightly smaller range in perpendicular missing momenta will be covered, it removes the overhead of moving and surveying the spectrometer during the experiment and helps reduce calibration issues, since only one location and central momentum of the BigBite spectrometer will be needed.