

LOI12-14-002: *Tensor asymmetry A_{zz} in the $x > 1$ region*

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This Letter of Intent describes a measurement of the tensor-polarized asymmetry A_{zz} in electron scattering on polarized deuterium in the quasi-elastic region, at values of $x = 0.8 - 1.75$ (x is the equivalent Bjorken variable at the nucleon level) and $Q^2 = 1 - 2 \text{ GeV}^2$. The aim is to determine with this observable the S/D wave ratio in the deuteron wave function at large relative momenta $k > 300 \text{ MeV}$, which is important for understanding the NN interaction at short distances and the properties of the dominant pn short-range correlations in heavier nuclei. The same tensor-polarized asymmetry was/will be measured in elastic scattering (deuteron form factor) and deep-inelastic scattering (structure function b_1); the proposed measurement in quasi-elastic scattering would fill the gap and study this observable in the region where it is most directly related to the short-range NN interaction. The tensor asymmetry at large recoil momenta also serves as a sensitive test of “relativistic effects” in the treatment of deuteron structure, which are an important aspect of the overall theoretical framework and the object of ongoing studies. A unique feature of the measurement proposed here is that it selects small-size configurations in the deuteron *both* through the tensor asymmetry (D -state) *and* the choice of kinematics ($x > 1$), amplifying the overall effect. The use of $x > 1$ for selecting small-size NN configurations has been demonstrated in previous studies of deep-inelastic structure.

The measurement proposed here arises from a well-developed context, presents a clear objective, and enjoys strong theory support. It would further explore the nature of short-range pn correlations in nuclei, the discovery of which has been one of the most important results of the JLab 6 GeV nuclear program. Development of a full proposal should be encouraged.