E12-10-006B: *Measurement of Deep Exclusive π^- Production using a Transversely Polarized ^{3}He Target and the SoLID Spectrometer*

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This proposal aims primarily at a measurement of the $A_{UT}^{\sin(\phi-\phi_s)}$ asymmetry, and, secondarily, of the $A_{UT}^{\sin\phi_s}$ asymmetry in Deeply Exclusive π^- production on (bound) neutrons, utilizing currently available transversely polarized ^{3}He targets. The goal is to provide access to the $\tilde{E}$ GPD through an unseparated measurement of transverse and longitudinal photon double spin asymmetries.

This proposal is meant to complement proposal PR12-12-005, that envisaged a Rosenbluth-type separation of the $A_L^\perp \propto \tilde{E}$ contribution to the $A_{UT}^{\sin(\phi-\phi_s)}$ asymmetry. Achieving the desired statistics for a precise enough separation requires, however, the development of a new generation polarized Helium target (currently being developed at New Hampshire U.) to provide the required high luminosity levels. Since this is a completely new technology, no timeline has been established for that experiment. This proposal aims, instead, at providing shorter term results than PR12-12-005, with an unseparated measurement, that builds on pioneering HERMES results in exclusive π^+ production on proton targets and does not need additional beam time compared to E12-10-006. It is thus an interesting measurement, worth pursuing.

The authors may want, however, to expand on possible contamination arising from Δ^{++} production on bound protons, and subsequent decay into π^+ and p.

A further issue to be considered concerns nuclear effects. This is important for comparisons to HERMES data, as well as for understanding how the proposed measurements can be utilized in a combined fit with proton target measurements. In particular, depending on the kinematics of each data points, these may or may not be directly utilized in a global fit. While there already exists a considerable theoretical and phenomenological expertise in treating nuclear corrections in the case of inclusive DIS observables, those to bound neutron GPDs have been much less explored. Since the size of the latter might well be larger than in the inclusive case due to the exclusivity of the measurements, it is paramount to estimate this. As a first step, the authors may want to switch off Fermi motion in their simulations and determine

how large and in which kinematics they see a difference. Having evidence of non-negligible nuclear effects at an early stage would encourage theorists to extend now their calculations from inclusive to exclusive measurements for a timely and correct utilization of the data the authors propose to take. It would also be helpful to elaborate on the possible corrections in addition to Fermi motion, such as from binding and nucleon off-shell effects, as well as corrections beyond the impulse approximation from rescattering or final state interactions of the detected proton.