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Study of the Reaction $^2\mathrm{H}(\vec{e}, e'\vec{p})n$ in the Δ Region

Co-spokesperson: William Bertozzi (email: bertozzi@mitlns.mit.edu)

Co-spokesperson(contact): Zilu Zhou (email: zzhou@mitlns.mit.edu)

Abstract

We propose to make precise measurements of the $^2\mathrm{H}(\vec{e}, e'\vec{p})n$ reaction at the Δ-kinematics region. We emphasize the measurements of the differential cross-section, helicity-independent polarization p_n^0, and helicity-dependent polarization components p_t' and p_l' at high initial momenta ($P_m \sim 290 - 450$ MeV/c) and high energy transfer over a large range of proton/virtual-photon angles. Six individual structure functions: helicity-dependent $f_{LT}'^{t}$, $f_{LT}'^{l}$, $f_T'^{t}$ and $f_T'^{l}$, and helicity-independent f_{LT}^n and f_{LT} will be separated. In addition, we will determine the combinations $f_L^n + \frac{\rho_T}{\rho_L} f_T^n + \frac{\rho_{TT}}{\rho_L} f_{TT}^n$ and $f_L + \frac{\rho_T}{\rho_L} f_T + \frac{\rho_{TT}}{\rho_L} f_{TT}$. A careful study of the deuteron is fundamentally important to nuclear physics. Measurements of the recoil proton polarizations and consequently the separated structure functions will give us more complete information about the different aspects of the np system and sub-nucleonic degrees of freedom including meson-exchange currents and isobar configurations, and thus provide a stringent test for theoretical calculations.

Exp. No.	Description	Beam Hours	Energy(GeV)	Current(μA)	Duty Factor
	$^2\mathrm{H}(\vec{e}, e'\vec{p})n$	528	1.645	50	CW