GEn-RP: Neutron Electric Form Factor Measurement using Recoil Polarimetry at Jefferson Lab

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The electromagnetic form factors of nucleons are fundamental observables that provide crucial constraints for theoretical predictions of hadron structure. The Super Bigbite Spectrometer (SBS) program at Jefferson Lab (JLab) comprises a suite of experiments measuring nucleon electromagnetic form factors at high momentum transfer. This presentation focuses on one of these experiments, GEn-RP, which aims to measure the neutron electric form factor (GEn) at the highest Q^2 to date using recoil polarimetry (RP).

The experiment makes use of CEBAF's high-luminosity, highly polarised electron beam scattered from an unpolarised liquid deuterium target. By measuring the polarisation transfer to recoiling neutrons, GEn can be extracted from the ratio of transverse to longitudinal polarisation components (Pt/Pl). At high momentum transfer, traditional neutron polarimetry via np→np scattering becomes challenging due to decreasing analysing power. GEn-RP aims to validate the charge exchange (np→pn) polarimetry technique that maintains analysing power at higher Q^2, enabling future form factor measurements at unprecedented energies.

Data collection was completed in Hall A at Jefferson Lab between April 16 and May 14, 2024, using typical beam current of 10-12 μA on LD2 at $Q^2 = 4.4$ $(GeV/c)^2$. Preliminary analysis reveals expected azimuthal asymmetry, with ongoing work to refine these results. This presentation will detail the experimental setup, analysis procedures, and preliminary findings from the collaboration.