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Studying Short-Range Nuclear Forces short range correlations through ρ0 photoproduction at Jefferson Lab

Short Range Correlations (SRCs) are a phenomenon found in all nuclei where two nucleons form a strongly interacting, close-proximity pair in the nucleus, leading to a large relative momentum between the nucleons. Electron-scattering experiments, many of them conducted at Jefferson Lab, have determined that the prevalence of SRCs increase with nuclear size, and furthermore that most SRCs form between a neutron and a proton, a property called 'np-dominance.'Since these observations have largely come from the same type of experiment, it is possible that they are biased by reaction-specific effects, for example, final state interactions interactions. To test thisthe validity of previous observations, an experiment was conducted in Hall D in Fall 2021 using a photon beam on deuterium, helium, and carbon targets to probe SRCs through photoproduction reactions , a radically different approachto test the validity of many previous SRC observations. A preliminary look at the data showsThe preliminary results show clear signatures of SRCs, marking the first time that SRCs have been isolated in photoproduction. Using the ρ0 reaction channel, I plan to compare the rate of proton-proton SRC pairs to that of one proton SRC pairs to test for np-dominance. To assess relative abundances of SRC pairs between heavier targets, I will compare the rates of SRC events from ρ0 photoproduction in carbon and helium to deuterium. I will also show how these results compare to Monte Carlo simulations.

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