Using Short-Lived Beams for Nuclear Physics in the CLAS Detector*

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The structure of the nucleon is studied by measuring its interactions with different beam particles, such as protons, electrons, photons, pions, and kaons. Using short-lived beams, such as the Λ, Σ, or K_S, would produce data on the structure of the nucleon that cannot be obtained in any other way. This is accomplished by producing the beam particle within a target, after which it can interact with a second target particle. Such measurements were done using bubble chambers in the 1960s and 1970s, but their results are statistics-limited. While today's 4π detectors do not have the precision available to the older measurements, the attainable event rates are several orders of magnitude higher. The CSUDH Hadronic Structure Laboratory pioneered the use of this technique with a study of Λp elastic scattering using Λs from the process $\gamma p \to K^+ \Lambda$. The use of exclusively produces Λs limits the Λ flux, as there are many other ways to produce a Λ. Our group is now pursuing the inclusive production of short-lived beam particles. The main challenges in this project involve event selection, the determination of the beam flux, and the calculation of the effective target thickness. This talk will present the motivation behind this research, discuss the current status of our analyses, and future applications of this technique.

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