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# Light ion polarimetry at high energy

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Peripheral scattering of polarized proton, deuteron, and Helium-3 ions on light nuclei, and other nuclei, provides a method of evaluating the level of polarization of high energy beams. The asymmetry of recoils resulting from elastic collision can indicate the analyzing power required for polarimetry provided a number of quantities are known with sufficient accuracy.

Among the items needed is the Coulomb phase, $\delta_C \propto ZZ'\alpha$, encoding second order electromagnetic corrections to the scattering of charge $Z$ ions on nuclei of charge $Z'$. This phase varies from about 7% to 12% as $ZZ'$ ranges from 4 (3He-3He) to 12 (3He-12C) in the interference region. The behavior of the analyzing power as a function of momentum transfer is discussed, avoiding the assumption that $\delta_C$ is small as is common for the case of polarized proton proton scattering.

An expression for the momentum transfer at which the size of the analyzing power reaches a maximum is presented that involves electromagnetic form factors, the hadronic slope of the near forward differential cross section, and to first order, a contribution from the single helicity-flip hadronic amplitude normalized to the imaginary non-flip hadronic amplitude. The extreme value of the analyzing power is also noted, a value that depends upon the total cross section of the reaction and $\rho$, the real to imaginary ratio of the spin-averaged hadronic amplitude.

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