

A Proposal to Measure Nucleon Axial-Vector Form Factor using Polarized Electron Beam

The form factors are important physical quantities that characterize the internal structure of a nucleon. In the classical picture, it corresponds to the Fourier transform of the nucleon's three-dimensional density distribution. Among them, the electromagnetic form factors are the most well-known, with thousands of high-precision experimental data accumulated to date. The axial form factor is another essential type of nucleon form factor. It is not only a crucial input for neutrino oscillation experiments but also plays a significant role in constraining the nucleon's generalized parton distribution functions. However, compared to the electromagnetic form factors, the axial form factor suffers from both a scarcity of data and limited precision. Traditionally, its measurement relies on neutrino scattering and near-threshold pion electroproduction, both of which face inherent limitations. In this talk, I will present a novel measurement scheme and experimental concept based on high-precision polarized electron beams, which promises to overcome many of the shortcomings of existing methods. This experiment is planned to be carried out at Jefferson Lab and is currently in the design phase.

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