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# Elastic Scattering of Neutrons with Orbital Angular Momentum on Nuclear Targets

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We study the scattering of twisted neutrons with orbital angular momentum (OAM) from nuclear targets. A theoretical model is developed for Laguerre-Gaussian neutron states, accounting for nuclear and electromagnetic interactions and their interference.

We show that OAM and beam localization significantly modify the differential scattering cross section, while spatially inhomogeneous polarization produces characteristic azimuthal modulations. The interference between nuclear and electromagnetic amplitudes is sensitive to the phase of the nuclear scattering amplitude, making angular asymmetries a potential tool for its experimental investigation. Our results demonstrate new possibilities for controlling and probing low-energy neutron-nucleus interactions using structured neutron beams.

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