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Experimental Validation and Geant4 Simulation of Spatial Resolution in Fast Neutron Radiography at CSNS Back-n Facility

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Fast neutron radiography offers distinct advantages over conventional X-ray radiography, demonstrating significant developmental potential and broad application prospects in strategic fields including national defense, aviation, aerospace, and nuclear energy. As a critical performance indicator for imaging systems, spatial resolution has been extensively studied through theoretical simulations in current research, while experimental investigations remain comparatively limited.
This study develops a comprehensive simulation methodology for system spatial resolution using Geant4 Monte Carlo simulations, complemented by systematic experimental validation at the Back-n white neutron source facility of the China Spallation Neutron Source (CSNS). The experimental results exhibit close agreement with theoretical predictions, thereby establishing crucial technical foundations for advancing fast neutron radiography applications. This work bridges the gap between simulation and experimental research while providing valuable insights for optimizing imaging system performance in practical implementations.

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