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Experimental Landscape of Neutrino Scattering Physics

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A precise understanding of neutrino interactions is essential for fully exploiting the physics potential of current and next-generation neutrino experiments. In particular, uncertainties in neutrino–nucleus interactions and nuclear effects are becoming increasingly important as oscillation measurements enter the precision era. At the same time, measurements of neutrino scattering provide unique information on nucleon and nuclear structure and offer opportunities to search for physics beyond the Standard Model.

This talk will review the current experimental landscape of neutrino scattering physics. Recent results from accelerator-based neutrino experiments will be presented, with emphasis on measurements of inclusive and exclusive interaction channels, final-state particle kinematics, and the role of nuclear effects. The experimental techniques used to detect low-momentum protons, neutrons, and pions will also be discussed, together with progress in detector technologies and analysis methods.

The complementarity of measurements using different neutrino energies, target nuclei, and detector technologies will be highlighted. Particular attention will be given to comparisons between experimental data and neutrino-interaction models and to the remaining challenges in reducing systematic uncertainties for precision oscillation measurements. Finally, prospects for upcoming measurements and future experimental programs will be discussed.

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