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Enhancing Solar Neutrino Sensitivity with Neutron Tagging

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Solar neutrinos offer crucial insights into neutrino properties and serve as a powerful probe of flavor oscillations in matter. However, detecting them requires effective suppression of backgrounds. One of these is spallation backgrounds—beta decays of unstable isotopes produced by cosmic-ray muons—which pose a major challenge above 5 MeV. We show that neutron tagging, made possible by the recent addition of dissolved gadolinium, provides a powerful new method to identify and reject these backgrounds. This technique is particularly relevant for future shallower detectors like Hyper-Kamiokande and JUNO.

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