

Abstract Submitted
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Antineutrino Searches with a “Look-Back” Analysis TIMOTHY SHOKAIR, UC Berkeley — Antineutrinos are identified in water Cherenkov detectors by a time-correlated coincidence of a prompt positron and either a single delayed neutron in the inverse beta decay on protons or two delayed neutrons in the inverse beta decay on deuterium. Using data from the Sudbury Neutrino Observatory (SNO), a new method is demonstrated for antineutrino coincidence identification. In Phase II of SNO, neutrons were identified by their capture on chlorine where the γ -cascade energy is 8.6 MeV, while the inverse beta decay of reactor antineutrinos on deuterium produces positrons peaked near 2 MeV. This analysis exploited the difference in the energy distributions of prompt and delayed particles by first searching for the higher energy neutron with one energy threshold and then looking back in time with a lower energy threshold. This “look-back” analysis increased the sensitivity to antineutrinos compared to previous analyses without significantly increasing the expected background. Applying this method to the SNO dataset gave the best limits to date on the solar antineutrino flux from a water Cherenkov experiment. This method can improve the detection efficiency for future water Cherenkov antineutrino detectors.

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