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Energy Calibration Studies for the Reactor Antineutrino Search at SNO+

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The SNO+ experiment is a kilo tonne-scale liquid scintillator neutrino detector located 2 km underground at SNOLAB in Sudbury, Ontario. Within its broad physics program, SNO+ detects anti-neutrinos through an inverse beta decay (IBD) reaction, producing a characteristic delayed-coincidence signal that can be easily separated from most backgrounds. This allows SNO+ to make two key measurements: the determination of a subset of neutrino mixing parameters from reactor anti-neutrino oscillations, and the flux of geo-neutrinos emitted from the decay of unstable elements in the Earth. The SNO+ collaboration has recently released improved measurements for both.

An important component of the improved anti-neutrino analysis was the use of a deployed ^{241}Am-^{9}Be neutron calibration source, which produces a delayed-coincidence signal similar to IBD interactions. The calibration campaign was used to validate our understanding of the detector response to this type of event. This, in turn, enabled the first-time use of a novel analysis technique to distinguish IBD events from a class of background delayed-coincidence events caused by neutrons produced by (α, n) reactions within the detector. This talk will summarize these recent results and highlight the role of the calibration campaign in enabling this improved analysis.

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