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Event by Event classification of alpha-n and IBD Interactions at SNO+

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In the study of reactor and geo antineutrinos, tagging of the inverse beta decay (IBD) positron-neutron coincidence signature allows for the elimination of most backgrounds. In many detectors, the primary remaining background is caused by α captures on 13C —so called (α, n) events —which release a neutron and closely mimic the IBD's signature. The most common (α, n) prompt event is produced by protons recoiling from the neutron, which gives rise to a distinct pulse shape compared to that of the positron from an IBD. A powerful classifier is thus presented, able to purify the IBD signal from most of its (α, n) background, by discriminating between these pulse shapes. Particular attention is paid to the construction of appropriate training data from Monte-Carlo simulations. The tuning of the β and proton scintillation timing models in these simulations for SNO+ is also discussed. Tuning of the former is achieved via the selection of a high purity sample of in-situ ^{214}Bi to ^{214}Po decays. The latter makes use of the deployment of a radioactive Americium-Beryllium source. Finally, results of this classification

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Poster prize

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Collaboration (if any)

SNO+

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