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9Li/8He estimation and reduction in JUNO

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In the Jiangmen Underground Neutrino Observatory (JUNO), cosmogenic muon-induced radioactive isotopes, particularly ${}^9\text{Li}/{}^8\text{He}$, which undergo β -n decays, produce correlated signals that closely mimic the inverse beta decay (IBD) signature. This constitutes one of the major backgrounds for reactor antineutrino oscillation analyses, with an initial rate of $\sim 60/\text{day}$ before applying any muon veto. This talk presents comprehensive strategies for 9Li/8He reduction and background estimation. To effectively suppress this background, we optimized traditional spatiotemporal veto cuts based on the distance to the parent muon track, the distance to spallation neutrons, and the time elapsed since the muon crossing. Coupled with a robust data-driven IBD efficiency estimation approach, this methodology drastically reduces the 9Li/8He background from $\sim 60/\text{day}$ to $\sim 2/\text{day}$ while preserving a high IBD efficiency. In addition, machine learning approaches are investigated as complementary tools for background rejection, demonstrating further potential for achieving the precision required by JUNO's core oscillation measurements.

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