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Sources of background and veto strategies for background mitigation in the JUNO experiment

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The Jiangmen Underground Neutrino Observatory, is a multipurpose neutrino experiment located at 53 km from the Yangjiang and Taishan nuclear power plants in south-east China. Its main purpose is determining the neutrino mass ordering using precision spectral measurement of the reactor neutrino signal. The detector is composed of a 20 kiloton spherical liquid scintillator (LS) volume seen by 17612 20" photomultiplier tubes (PMT) and 25600 3" PMTs. The LS volume is enclosed in a water Cerenkov veto filled with 34 kton of ultrapure water seen by 2400 20" PMTs. A muon tracker composed of 3 layers of plastic scintillator strips surmounts the LS volume. The neutrino detection is done through inverse beta decay (IBD) resulting in a two-fold signal given by the positron and the neutron capture on H after ~200μs. Various processes can mimic IBD, hence contributing to the background in the detector: natural radioactivity, cosmogenic isotopes, fast neutrons and (α,n) reactions are the major backgrounds of the reactor neutrino signal. A set of cuts including fiducial volume, energy, PSD, time-position correlation of the prompt and delayed signal helps to mitigate accidentals and (α,n) backgrounds. To reject the cosmogenics induced by muons with a rate of ~4Hz, muon veto cuts are necessary: an optimized volume around the muon track or cosmic-induced neutron is vetoed. In this talk, we'll present the backgrounds to the neutrino signal and the veto strategies to mitigate these backgrounds.

Submitted on behalf of a Collaboration?

Yes

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