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JUNO Calibration Complex and its Simulation

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The Jiangmen Underground Neutrino Observatory (JUNO) is designed to primarily measure the neutrino mass hierarchy. The JUNO central detector (CD) would be the world largest liquid scintillator (LS) detector with an unprecedented energy resolution of $3\%/\sqrt{E(\text{MeV})}$ and a superior energy nonlinearity better than 1%. A calibration complex, including Cable Loop System (CLS), Guide Tube Calibration System (GTCS), Auto Calibration Unit (ACU), and Remotely Operated Vehicle (ROV), is introduced with deploying multiple radioactive sources in various locations inside/outside of the CD to achieve this challenging calibration goal. The design and strategy of the JUNO calibration system had been optimized based on full Monte Carlo simulation results. The energy response could be described by fitting data from ACU, CLS and GTCS (or ROV) at given calibration points. And a concise spline function is utilized to predict a “blank” energy region and a correction function is applied to the uniformity of energy response. This talk will present details of the JUNO calibration complex and simulation results which help achieve an excellent energy resolution of 2.98% for 1.022 MeV uniformly distributed positrons with $\sim 0.04\%$ bias.

Consider for promotion

Yes

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