Abstract

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Evaluation of recoil rates in a CEvNS-based detector for reactor antineutrino monitoring

Coherent electron neutrino-nucleus scattering (CEvNS) is a promising method for nuclear reactor monitoring. Depending on the detector material, the CEvNS cross section can be 1-3 orders of magnitude larger than the inverse beta decay (IBD) cross section, but CEvNS is equally sensitive to neutrinos and antineutrinos. An open source-code for COHERENT has been employed for calculation of expected event rates in CEvNS-based detectors for typical reactor monitoring scenarios. CEvNS cross sections for the antineutrino energies of interest are also calculated analytically and compared to COHERENT calculations. As a simple approximation, published low-energy reactor antineutrino spectra are combined to reflect the time-dependent spectrum during the fuel cycle. The evolution of 40Ar recoil spectra for CEvNS is then evaluated at several stages of the fuel cycle to predict the event rates and the sensitivity of this method for reactor monitoring.