

Observation of low-lying isomeric states in ^{136}Cs : a new avenue for dark matter and solar neutrino detection in xenon detectors

Friday, 21 June 2024 17:30 (2 hours)

Xenon-based detectors are powerful tools in the search for low energy signatures of new physics. Here we report experimental results that open up a new channel for rare event searches in these detectors: MeV-scale charged-current interactions on ^{136}Xe nuclei. These interactions will populate low-lying $1+$ excited states in ^{136}Cs , which then relax to the ground state through the emission of characteristic gamma rays. We have performed measurements of γ rays produced by $^{136}\text{Xe}(p,n)^{136}\text{Cs}$ reactions, providing the first data on the gamma ray emission from the relevant excited states. We also identify two isomeric states with $O(100)$ -ns lifetimes, which will create delayed-coincidence signatures in charged-current interactions that can be used to dramatically suppress backgrounds. These results could enable xenon-based detectors to perform background-free measurements of solar ^7Be and CNO neutrinos, as well as achieve world-leading sensitivity to dark matter particles interacting with nuclei through new charged-current-like interactions.

Poster prize

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Session Classification: Poster session and reception 2

Track Classification: Solar neutrinos