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

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Xenon-based detectors are powerful tools in the search for low energy signatures of new physics. Here we report on 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 populate low-lying 1+ excited states in ^{136}Cs, which then relax to the ground state. We have performed measurements of γ rays produced by (p, n) reactions on ^{136}Xe, providing the first data on the gamma ray emission from the relevant excited states in ^{136}Cs. We identify two isomeric states with O(100)˜ns lifetimes, enabling delayed-coincidence analyses that can dramatically suppress backgrounds. These results may enable xenon-based detectors to perform background-free measurements of solar ^{7}Be and CNO neutrinos, as well as achieve unprecedented sensitivity to dark matter particles interacting with nuclei through new charged-current-like interactions.

Submitted on behalf of a Collaboration?

No

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