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Application of gamma Transition-Edge-Sensor (TES) to ^{112}Sn two-neutrino double electron capture search

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Double electron capture (DEC) is a rare nuclear decay process in which two orbital electrons are captured simultaneously in the same nucleus.

The measurement of its two-neutrino emitting mode provides a new reference for calculating nuclear matrix elements, while the zero-neutrino emitting mode would demonstrate a violation of lepton number conservation. The two-neutrino DEC mode in ^{124}Xe has been previously observed by the XENON1T experiment. For other nuclei, however, no significant signal was observed. For example, our target isotope of ^{112}Sn , DEC to the excited state in ^{112}Cd was searched using an HPGe detector, but no significant signal was observed. DEC to the ground state in ^{112}Cd has not been conducted so far.

We propose an approach to search for the DEC mode to the ground state in ^{112}Cd using gamma-ray Transition Edge Sensors (TES) with Sn absorbers.

The calorimetric (source = detector) configuration allows us to detect two X-ray or Auger electrons resulting from the ^{112}Sn DEC mode with high resolution.

The state-of-the-art multi-pixel TESs increase the target amount, enhancing sensitivity.

In this presentation, we will present the demonstration of our search for the ^{112}Sn two neutrino DEC using gamma-ray TES and future prospects.

Submitted on behalf of a Collaboration?

No

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