Contribution ID: **382** Type: **Poster**

Sensitivity of search for double beta decay of 130Te to excited daughter state in CUORE

Wednesday 27 August 2025 18:00 (2 hours)

Double beta decay to an excited state of the daughter nucleus may be considered in addition to the more probable decay to ground state. Though it suffers from a reduced phase space, the decay to an excited state has a unique experimental signature, distinguished by coincident gamma rays from the de-excitation of the daughter nucleus. So far, the two-neutrino excited state decay has only been observed in ^{150}Nd and ^{100}Mo. The Cryogenic Underground Observatory for Rare Events (CUORE) is an array of 988 crystals of TeO_2 operated at millikelvin temperatures, with each crystal serving as both a source and a calorimetric detector. The segmented nature of the CUORE detector provides a distinct setting to search for excited state decays, with coincident energy depositions in more than one crystal. This coincidence signature provides a complementary test of the nuclear physics of double beta decay with much reduced backgrounds compared to decays to a final ground state. Here, I will report on sensitivity studies on a search for double beta decay of ^{130}Te to the lowest 0^+ excited final state of ^{130}Xe with 2 tonne-years of data.

Collaboration you are representing

CUORE

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Session Classification: Poster session

Track Classification: Neutrino Physics and Astrophysics