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Ab initio Combined Neutrino Mass Limits

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Neutrinoless double-beta decay is a hypothetical second-order weak process that involves the decay of a pair of neutrons into two protons and two electrons. Observation of this decay will point to a Majorana nature of the neutrino, lepton number violation, the absolute mass scale of the neutrino and possibly further new physics. Crucially, constraining neutrino masses from current and next-generation experiments requires the use of nuclear matrix elements, which until now have only been obtainable through phenomenological methods. However, recent developments have made these matrix elements accessible through ab initio nuclear theory.

Using a Bayesian approach, we combine likelihoods from leading experiments to obtain a global neutrino mass constraint from ab initio nuclear matrix elements. Furthermore, utilizing a simple Poisson counting analysis, we construct the combined sensitivity reach from several next-generation experiments. Limits are also computed for a heavy sterile-neutrino exchange mechanism instead of the standard light-neutrino exchange, which arises in many theories beyond the Standard Model. These constraints allow us to determine the total physics reach of all neutrinoless double-beta decay experiments combined, better informing our exclusion reach on the absolute mass scale of the neutrino.

What area of study best describes your talk?

Physics

If you answered 'Other', please provide the study area.

Primary author: SHICKELE, Taiki (UBC/TRIUMF)

Presenter: SHICKELE, Taiki (UBC/TRIUMF)

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