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Neutrinoless Double Beta Decay: The Current Status and Future Prospects

Wednesday 23 October 2024 10:20 (40 minutes)

This talk will explore the current landscape of neutrinoless double beta decay ($0\nu\beta\beta$) searches, a phenomenon that, if observed, would provide direct evidence that neutrinos are their own antiparticles (Majorana fermions). The implications of such a discovery extend beyond the realm of particle physics, potentially offering insights into the origin of neutrino mass and the matter-antimatter asymmetry in the Universe.

The talk will then present a comprehensive survey of the experimental landscape, showcasing the diverse approaches employed to detect $0\nu\beta\beta$, including the use of high-purity germanium detectors, liquid scintillators, and bolometric techniques. I will highlight recent experimental results, including the most stringent limits on the $0\nu\beta\beta$ half-life for various isotopes. The challenges and future prospects of $0\nu\beta\beta$ searches will also be discussed, with a focus on the next-generation experiments that aim to significantly improve sensitivity and explore new regions of parameter space. This talk will underscore the crucial role of $0\nu\beta\beta$ searches in advancing our understanding of neutrinos and their place within the broader framework of particle physics and cosmology.

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