

Testing Lorentz invariant violation by double-beta decay

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Double-beta decay is a currently research topic as it can offer a wide range of physics investigations beyond the Standard Model (SM). These refer to fundamental neutrino properties, yet unknown (is neutrino a Dirac or a Majorana particle?, neutrino absolute mass and mass hierarchy, number of neutrino flavors, etc.), conservation of lepton number and validity of Lorentz and CP symmetries, as well as to different beyond SM mechanisms that can contribute to the neutrinoless double-beta decay.

In my talk I'll first summarize facing the DBD study. Then, I'll focus on the DBD potential to test various beyond SM physics scenarios. In particular, I'll present the status of Lorentz invariance violation (LIV) investigations by the DBD study. These are conducted in current or planned DBD experiments like EXO, GERDA, NEMO3/SuperNEMO, Majorana, CUORE/CUPID-0, and are based on one side, on precise measurements of the electron spectra, and on the other side, on reliable calculations of these spectra. I'll present the theoretical formalisms and precise calculation of single, summed and angular correlation of the electron spectra, along with their deviations due to LIV. Next, I'll show different LIV signatures that can be investigated in DBD experiments and the current constraints of the coefficient that governs the LIV strengths. Finally, I'll propose an alternative, new method of constraining the LIV coefficient by measuring the angular correlation coefficient, and show that the next future DBD experiments can improve significantly the current limits.

References

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