

Nuclear structure observables as a way to determine $\beta\beta$ decay nuclear matrix elements

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Neutrinoless $\beta\beta$ decay is a special nuclear process where a nucleus decays into its isobar with two more protons by only emitting two electrons. This beyond-standard-model decay can establish the nature of neutrinos and shed light into the matter-antimatter asymmetry of the universe [1]. The process, if exists, is sensitive to the structure of the initial, intermediate and final nuclei of the $\beta\beta$ decay [2].

In this talk I will present different ways in which nuclear structure information can be used to learn about the unknown nuclear matrix elements of the neutrinoless $\beta\beta$ decay. First, recent spectroscopy studies of the relevant nuclei, such as ^{136}Cs , allows one to test different shell-model Hamiltonians which predict different values for the nuclear matrix elements [3]. These measurements complement the nucleon removal and addition experiments carried out at Argonne National Laboratory in the past two decades [4].

Second, I will propose nuclear structure observables which in shell-model and other many-body calculations appear to be correlated with $\beta\beta$ decay nuclear matrix elements, such as double Gamow-Teller [5] and double magnetic-dipole transitions [6, 7]. Measurements of these nuclear structure observables, which are being pursued by different groups, would provide very valuable insights on neutrinoless $\beta\beta$ decay nuclear matrix elements in nuclear structure experiments.

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