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Nuclear Deformation and the search for neutrinoless double beta decay $(0\nu\beta\beta)$: A case study of ^{76}Ge

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Content :

Observation of neutrinoless double-beta decay $(0\nu\beta\beta)$ would both demonstrate the Majorana nature of the neutrino and provide experimental access to its absolute mass scale. A great deal of experimental effort is, therefore, being dedicated to the detection of this rare process. However, results of nuclear structure calculations of nuclear matrix elements which mediate the decay differ by up to a factor of three, depending on the methodology. This translates into an order of magnitude variation when considered in terms of the decay lifetime. Experimental input from a nuclear structure perspective to constrain these calculations is, thus, imperative and significant experimental work (e.g., studies of transfer reactions, gamma-ray spectroscopy, etc.) has already been done in this context. In this talk, results of a high-precision Coulomb excitation measurement of ^{76}Ge, performed at Argonne National Laboratory using GRETINA and CHICO2 will be presented. The results will be compared with state-of-the-art Shell Model calculations and recently obtained $(n,n'\gamma)$, with emphasis on demonstrating the importance of nuclear deformation in determining the nuclear decay matrix element.

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