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Shape Mixing in Onbb Candidates

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The search for neutrino-less double-beta decays is one of the major strives to foster our understanding on the nature of neutrinos. Firstly, the observation of this rare process would identify its fundamental nature as a Majorana particle. Secondly, it would allow to extract a neutrino mass. The latter, however, is only possible via the input of matrix elements from nuclear structure models. Many of the candidate isotopes to search for 0nbb decays are at the verge of changing deformation. In such regions, the phenomenon of shape coexistence - a challenge for many nuclear models - is common, and experiment needs to give constraints on the potential mixing of configurations with different nuclear deformations. A current program to measure the decay behavior of the scissors mode, a magnetic dipole-excited state, should give such constraints on shape mixing. Moreover, isovector parameters of nuclear models, which are difficult to obtain otherwise, such as isovector electro-magnetic charges, can be constrained from data [1,2]. The key technique to investigate the scissors mode is through photo-excitation experiments, which we perform at the S-DALINAC of TU Darmstadt, and at the HIGS facility at TUNL. First results will be presented, as well as complementary plans for experiments to study nuclear structure aspects that impact theoretical descriptions of double-beta decay and neutrino scattering.

J. Beller et al., Phys. Rev. Lett. 111, 172501 (2013).
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