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Shape transitions between and within Zr isotopes

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The Zirconium isotopes across the N=56,58 neutron sub-shell closures have been of special interest since years, sparked by the near doubly-magic features of ^{96}Zr and the subsequent rapid onset of collectivity with a deformed ground-state structure already in ^{100}Zr. Recent state-of-the-art model approaches [1] did not only correctly describe this shape phase transition in the Zr isotopic chain, but also the coexistence of non-collective structures and pronounced collectivity especially in ^{96,98}Zr. This transition between different structural realizations within an isotope, first established in ^{96}Zr [2], was attributed to the reordering of the effective valence spaces. The isotope ^{98}Zr is located on the transition from spherical to deformed ground state structures. However, information on collectivity of this isotope in terms of E2 observables has been notoriously difficult to obtain, since it is unstable, and the lifetime of its first excited 2^+ state turned out to be out of range for fast-timing techniques in decay spectroscopy, only giving an upper bound. In this work a new lower bound on this lifetime will be presented, obtained from Coulomb excitation of a radioactive ^{98}Zr beam [3]. This data has recently been complemented by a recoil-distance lifetime measurement following a two-neutron transfer reaction. The new data will be brought in context with the discussion of the shape-phase transition and the type-II shell evolution in ^{96,98}Zr.
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