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Look for non-axially deformed halo nuclei

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Halo phenomenon has long been a hot topic in nuclear physics. Due to the weakly binding nature, the Fermi surface of a halo nucleus is very close to the continuum threshold, and the pairing interaction can scatter nucleons from bound states to resonant ones in the continuum. It is therefore necessary to take into account the pairing correlations and continuum effects in describing the halo nuclei.

For spherical halo nuclei, the relativistic continuum Hartree-Bogoliubov (RCHB) theory interpreted microscopically the halo phenomenon in Li-11 and predicted the giant halo phenomena. For deformed halo nuclei, the deformed relativistic Hartree-Bogoliubov theory in continuum (DRHBc), which takes into account the axial deformation degrees of freedom, pairing correlations, and continuum effects in a unified way, predicted the deformed halo nucleus Mg-44 and a shape decoupling between the core and the halo.

The non-axial shape, i.e., triaxiality, plays an essential role in understanding the nuclear chirality and wobbling. In order to explore the non-axially deformed halo nuclei, the triaxial relativistic Hartree-Bogoliubov theory in continuum (TRHBc) is developed, and the possible triaxially deformed halo nucleus Al-42 is investigated as an example.

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