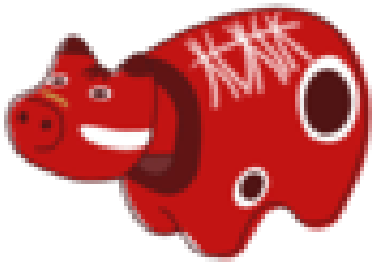

Contribution ID: **6** Type: **not specified**

Pseudo-spin symmetry and tensor force

Wednesday, 5 March 2025 14:05 (20 minutes)

As representing the shell structure in certain regions, the pseudo-spin symmetry (PSS) has been found helpful in describing some characteristic structures of nuclei. In short, the PSS is the near degeneracy of single-particle (s.p.) orbitals with $j = 1$ and $\ell = 2$. It has been argued since the late 1990s that the PSS is a relativistic symmetry, as the s.p. orbitals have equal orbital angular momentum in the lower component of the Dirac spinor. In addition to the spherical nuclei, the PSS was extended to rotational nuclei by Bohr, Hamamoto and Mottelson (Phys. Scr. 26, 267).

The tensor force has been pointed out to give rise to proton- (Z) and neutron-number (N) dependence of the shell structure. This Z- and N-dependence of the shell structure should be relevant to the PSS. We discuss how the tensor force affects the PSS, with particular interest in the variation due to the occupation of specific orbits. The spherical Hartree-Fock calculations are applied, and the s.p. energy spacings between the PSS partners are compared among effective interactions (or energy-density functionals) with and without the tensor force. In many cases, the tensor-force effects on the PSS look analogous to the Z-and N-dependence of the PSS in the relativistic mean-field (RMF) calculations without explicit tensor force. A qualitative difference is found in the variation of the $p0d_{3/2}$-$p1s_{1/2}$ levels from ^{40}Ca to ^{34}Si. The experimental data is consistent with the tensor-force-driven Z-dependence of the PSS but not necessarily with the RMF result.

(Based on the paper to appear in Phys. Rev. C, available as arXiv:2407.05524.)

Type of contribution

Are you a student or postdoc?

no

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