IMPORTANCE OF TENSOR FORCES IN GROUND STATES OF NUCLEI THROUGH HIGH-MOMENTUM NUCLEONS

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An appearance of the new magic numbers in neutron-rich nuclei triggered a new view to the nuclear interactions that affect orbitals in nuclei. In particular the importance of the tensor forces, that have not played an important roles in shell models, has been pointed out. For a long time, the tensor forces, that are originated from the pion exchange nucleon-nucleon interactions, has been known to play important roles for binding a deuteron and an alpha through D-wave mixing. The importance of the tensor forces has been also confirmed recently by ab-initio type nuclear models in light nuclei such as the Green's Function Monte Carlo method. Therefore it becomes urgent to understand the effects of the tensor forces in nuclei more in details. In particular the effect of high- momentum correlated nucleons in the nuclear ground states should be understood well.

For nuclei heavier than ^{4}He, effects of tensor forces through the momentum nucleon components were observed in:

- the magnetic moments of nuclei with doubly closed shell ± 1 nucleons,
- the mixing of s^2 and p^2 wave functions in the ground state of halo nucleus ^{11}Li,
- the enhancement of ^{16}O(p,d)^{15}O cross sections to the positive parity states of at high momentum transfer,
- the enhancement of the isospin=0 pn pair in (p,pd) reactions at high momentum transfer, and
- quenching of Gamow-Teller strengths,the positive value of correlation matrix $\langle S_p \bullet S_n \rangle$ for N=Z=even nuclei from M1 transitions.

We present explanations of those phenomena by a simple model of tensor interactions in nuclei and explain all of them qualitatively consistent using two-particle two-hole configurations with high-momentum nucleons due to the tensor interactions.