

Tensor optimized shell model and hypernuclei

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The pion plays dominant role on the structure of nuclei. The nucleon-nucleon interaction is dominated by the pion-exchange interaction at medium and long distance and by the short range repulsive interaction at short distance. We develop tensor optimized shell model (TOSM) for the description of nuclei to handle the medium and long range part with the help of unitary correlation operator model (UCOM) to handle the short range part.^{1,2} As the first step, TOSM is applied to ${}^4\text{He}$ and its result is compared with the calculated results of few body method. The calculated results of TOSM are very encouraging by reproducing the essential features of the calculated results of few body method. We are now in the position to calculate heavy nuclei in the TOSM.

This fact of the importance of pion is true also for hypernuclei. We discuss the role of pion for the structure of ${}^5_{\Lambda}\text{He}$.³ We are able to discuss why and how the Λ interfere with the ${}^4\text{He}$ core in order Λ to utilize the attraction due to the pion by jumping into the Σ states. This mechanism resembles with appearance of the spin-orbit splitting effect due to the pion exchange interaction in ${}^5\text{He}$. This comparison of the structure of nuclei and that of hypernuclei is one example of the effect of the pion in hadron many body system. We shall apply TOSM for heavy hypernuclei as well as heavy finite nuclei.

References

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