Microscopic structure of the low-lying negative-parity states in the proton-neutron symplectic model

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Abstract. The proton-neutron symplectic shell-model approach [1, 2, 3, 4, 5] is applied to the description of the microscopic structure of the low-lying negative-parity states of the $K^\pi = 0_1^-$ and $K^\pi = 1_1^-$ bands in ^{154}Sm and ^{238}U without the introduction of additional degrees of freedom that are inherent to other approaches to odd-parity nuclear states. A good description of the energy levels of the two bands under consideration, as well as the reproduction of some energy splitting quantities which are usually introduced in the literature as a measure of the octupole correlations, is obtained [3, 5]. Additionally, the low-energy $B(E1)$ transition strengths between the states of the ground band and $K^\pi = 0_1^-$ band for the two nuclei are calculated in the extended proton-neutron symplectic model and compared with experiment [5]. The results obtained reproduce well the experimental data for the two nuclei under consideration without the use of an effective charge, which could be considered as a significant achievement of the present approach.

References

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