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Thermal blocking effect and pairing reentrance in excited odd nuclei

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It has been well-known that the pairing correlations decrease with increasing temperature T. However, recent studies have reported a possible increase of pairing correlation in excited (hot) odd nuclei at low temperature (T < 0.5 −1 MeV), which is associated to the pairing reentrance phenomenon [1, 2]. The latter has been explained due to the blocking effect of odd nucleon in odd nuclei at finite temperature. This blocking effect possibly depends on few single-particle levels above and below the Fermi surface where the odd nucleon can redistribute at nonzero temperature. In this study, we perform a systematic investigation of such a pairing reentrance in odd nuclei based on the exact solution of pairing problem at finite temperature. Our investigation starts with a simple doubly-folded multilevel pairing model by varying the energies of some single-particle levels above and below the Fermi surface. Calculations will be then extended to some calcium isotopes using a realistic axially deformed Woods-Saxon potential.

References
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[2] Balaram Dey, Srijit Bhattacharya, Deepak Pandit, N. Dinh Dang, N. Ngoc Anh, L. Tan Phuc, and N. Quang Hung, Phys. Lett. B 819, 136445 (2021).

Experimental nuclear physics

Theoretical nuclear physics

1

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