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Self-consistent single-particle approximation to nuclear state densities at high excitation energy

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We compute nuclear state densities in the frame of the grand-canonical formalism in an energy (or, equivalently, temperature) range where residual two-body interactions and collective effects can reasonably be neglected. The single-particle states used in the calculations are generated in a self-consistent relativistic mean field at finite temperature [1] based on the NL3* [2] and DD-ME1 [3] effective interactions. Resonant single-particle states of small width (Gamow states), which are expected to give a sizable contribution at high temperatures, are evaluated by means of the complex scaling method [4]. Nuclear state densities are then evaluated for a number of even-even nuclei in a large mass region by the Gamow state method and by the subtraction method, originally formulated by Bonche, Levit and Vautherin [5], where the grand-canonical potential of the excited nucleus is obtained by subtracting from the thermodynamic potential of the nucleus in equilibrium with its vapour the potential of the vapour alone at the same temperature. The results of the two approaches are compared and the limits of the adopted formalism discussed.

`References`

[1] R. Lisboa, M. Malheiro and B. V. Carlson, Phys. Rev. C 93 (2016) 024321.

[2] G. A. Lalazissis, S. Karatzikos, R. Fossion, D. P. Arteaga, A. V. Afanasjev and P. Ring, Phys. Lett. B 671 (2009) 36.

[3] T. Niksic, D. Vretenar, P. Finelli and P. Ring, Phys. Rev. C 66 (2002) 024306.

[4] J.-Y. Guo, M. Yu, J. Wang, B.-M. Yao and P. Jiao, Comput. Phys. Comm. 181 (2010) 550.

[5] P. Bonche, S. Levit and D. Vautherin, Nucl. Phys. A 427 (1984) 278, A 436 (1985) 265.

Selected session

Nuclear Structure, Spectroscopy and Dynamics

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