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Pair vibrational modes and many-body effects

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We present a theoretical framework for treating the full excitation spectrum of Jπ = 0+ pair addition modes, including the well-known low-lying and bound Pairing Vibration on par with the predicted Giant Pairing Vibration lying in the continuum [1]. Our formalism includes the coupling to low-energy collective quadrupole modes of the core, in such a way that both single-particle self-energy effects and the pairing interaction induced by phonon exchange are accounted for. The theory is applied to the case of the excitation spectrum of 14C, recently populated by two-neutron transfer reactions [2]. We find that the particle vibration coupling drastically modifies the spectrum obtained by conventional pp-RPA calculations. We obtain good agreement with experimental data for bound states. Our calculations pave the way for detailed calculations of two-neutron transfer cross sections.

[1] F. Barranco, G. Potel and E. Vigezzi, ArXiv:2402.14166

[2] F. Cappuzzello, D. Carbone, M. Cavallaro, M. Bondì, C. Agodi, F. Azaiez, A. Bonaccorso, A. Cunsolo, L. Fortunato, A. Foti, S. Franchoo, E. Khan, R. Linares, J. Lubian, J.A. Scarpaci and A. Vitturi, Nature Comm. 6 (2015) 6743

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