
INTRODUCTION OF A VALENCE SPACE IN QRPA: IMPACT ON VIBRATIONAL MASS PARAMETERS AND SPECTROSCOPIC PROPERTIES

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The 5-Dimensional Collective Hamiltonian is one of our best tools to describe the entire chart of nuclei with as few free parameters as possible. However it is well known that the vibrational mass parameters $B_{\mu\nu}$ that are used as inputs lack correlations. Recently, Local Quasiparticle Random Phase Approximation has led to satisfactory results in calculating enriched mass parameters [1].

Using a unique interaction (D1M Gogny force [2]), a fully coherent and time-feasible way of obtaining the Bohr Hamiltonian vibrational mass is explored in a Hartree-Fock-Bogoliubov [3] + Quasiparticle Random Phase Approximation [4] (HFB + QRPA) framework. In order to reach handable computation time, we consider two restrictions for the QRPA: the Tamm-Dancoff Approximation and the insertion of a valence space. We establish the feasibility of our approach in the even-even tin isotopes comparing the convergence scheme of the mass parameter with those of built-in QRPA outputs: excited state energy and reduced transition probability.

The seeming convergence of these intrinsic quantities is shown to be misleading.

The TDA is excluded while we validate the use of an appropriate valence space, leading to a speedup factor of 30.

REFERENCES

- [1] N. Hinohara, K. Sato, T. Nakatsukasa, M. Matsuo, K. Matsuyanagi, Phys. Rev. C 82, 064313 (2010)
- [2] S. Goriely, S. Hilaire, M. Girod and S. Péru, Phys. Rev. Lett. 102, 242501 (2009)
- [3] S. Hilaire and M. Girod, Eur. Phys. J. A 33, 237 (2007)
- [4] S. Péru and H. Goutte, Phys. Rev. C 77, 044313 (2008)