

Integrability and weak diffraction in a one-dimensional two-particle Bose-Hubbard model

We provide strong numerical evidence that in a recently investigated one-dimensional two-particle Hubbard model [1–3], on a *finite* lattice, all the odd-parity eigenstates are in the Bethe form, whether the boundary condition is open or periodic. We also show explicitly that the even-parity eigenstates are not in the Bethe form. However, some of them are close to the Bethe form and can be considered *weakly diffractive*. As a by-product, we bring up a method based on the *Prony* algorithm to check whether a numerically obtained wave function is in the Bethe form or not, and if so, to extract parameters from it. This algorithm is applicable to many other Bethe ansatz relevant models.

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- [1] D. Braak, J. M. Zhang, M. Kollar, arXiv:1403.6875.
[2] J. M. Zhang, D. Braak, and M. Kollar, Phys. Rev. A **87**, 023613 (2013).
[3] J. M. Zhang, D. Braak, and M. Kollar, Phys. Rev. Lett. **109**, 116405 (2012).