

A 2D lattice system of two identical particles with interactions up to next-to-neighboring sites

Author: Alexander K. Motovilov^{None}

Corresponding Author: motovilv@theor.jinr.ru

We consider the lattice Schrödinger operator $H_{\gamma\lambda\mu}(K)$ associated with a system of two identical particles on the two-dimensional square lattice \mathbb{Z}^2 . It is assumed that the center-of-mass quasimomentum K equals zero and that the particles may interact with each other either on-site or on the first and second nearest neighbouring sites in the lattice. These interactions have magnitudes γ ,

λ and μ , respectively. We study the discrete spectrum of parts of the operator $H_{\gamma\lambda\mu}(0)$ in its certain reducing subspaces (the fermion subspace and a part of the boson subspace). We partition the corresponding (λ, μ) - and (γ, λ, μ) -parameter sets into connected components such that, in each component, the involved part of the Hamiltonian $H_{\gamma\lambda\mu}(0)$ has fixed numbers of eigenvalues below the bottom of the essential spectrum and above its top.

The talk is based on joint works 1 with S.N.Lakaev, S.Kh.,Abdukhakimov and 2 with S.N.Lakaev, M.O.Akhmadova.

This research was supported in part by the Ministry of Innovative Development of the Republic of Uzbekistan (Grant No. FZ-20200929224).

1 S.N. Lakaev, A.K. Motovilov, and S.Kh.Abdukhakimov, “Two-fermion lattice Hamiltonian with first and second nearest-neighboring-site interactions”, J. Phys. A: Math. Theor. 56 (2023), 315202 [23 pages].

2 S.N. Lakaev, A.K. Motovilov, and M.O.Akhmadova, “A two-boson lattice Hamiltonian with interactions up to next-neighboring sites”, arXiv:2410.07070 (2024).