The threshold effects for the two-particle Hamiltonians on lattices

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For a wide class of two-body energy operators h(k) on the three-dimensional lattice \mathbb{Z}^3 , k being the two-particle quasi-momentum, we prove that if the following two assumptions (i) and (ii) are satisfied, then for all nontrivial values $k, k \neq 0$, the discrete spectrum of h(k) below its threshold is non-empty. The assumptions are: (i) the two-particle Hamiltonian h(0) corresponding to the zero value of the quasi-momentum has either an eigenvalue or a virtual level at the bottom of its essential spectrum and (ii) the one-particle free Hamiltonians in the coordinate representation generate positivity preserving semi-groups.

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