INCOMMENSURATE AND SUPERCONDUCTING PHASES IN AN EXACTLY SOLVABLE MODEL OF STRONGLY CORRELATED ELECTRONS

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9.7 cm

We propose a lattice integrable model for description of the phenomenon of one-dimensional incommensurability and show that the incommensurate and superconducting phases can realize simultaneously. A modified one-dimensional Hubbard model with nearest neighbor t_1 and next nearest neighbor hoppings t_2 has been solved and investigated. The exact ground-state phase diagram in the $u-\tau-n$ ($u=U/t_1$, U is an on-site Coulomb interaction, $\tau=t_2/t_1$, n is the density of electrons) plane has been calculated. One finds four phases: two of them exhibit an off-diagonal long-range order and thus are superconducting and one of them exhibits incommensurate and superconducting phases. The last phase has been obtained firstly. It is shown, that the incommensurate phase is realized for ratios of the next nearest neighbor hopping integral greater than some critical value $\tau_c = 1/4$ or $\mid t_2 \mid > \frac{1}{4} \mid t_1 \mid$ in a defined region of the density of single carriers. This phase has been illustrated by calculations of the asymptotics of the correlation functions. In the incommensurate phase the asymptotics of the correlation functions depends on both the density of single carriers n_1 (or the Fermi momentum) and vector Q, here $Q=\arccos(-\frac{1}{4\tau})$.

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