

Reconstruction of the topological band structure in the Hofstadter-Hubbard model

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The new approach based on the Cluster Perturbation Theory was applied to the Hubbard model to reveal the effect of electron-electron interaction on the topological band structure.

In contrast with the all existing approaches based on mean field approximation our technique allows to obtain the qualitative changing in the structure of Hofstadter butterfly in the presence of Coulomb repulsion.

By taking into account a strong correlation in the more accurate way we can imply both: the regular behaviour of the Chern numbers and the more subtle splitting of the Chern bands induced by electron-electron interaction.

Such splitting can be interpreted as a signature of fractional Chern regime is typical for strongly correlated topological phases.

It was shown that the critical value of the Coulomb repulsion U_c inducing the Mott transition depends on magnetic flux.

Moreover, the Mott insulating phase can be closed and reopened by increasing the value of magnetic field.

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