Karl-Franzens-Universität Graz
Institut für Physik, Fachbereich Theoretische Physik

Der Wissenschaftsfonds.

Condensation in two flavor scalar electrodynamics with non-degenerate quark masses

Alexander Schmidt , Philippe de Forcrand, Christof Gattringer
University of Graz

Action

The **continuum action** of scalar electrodynamics is given by

$$S = \int d^4x \left(\frac{1}{4}|F_{\mu\nu}|^2 + |(\partial_\mu + ieA_\mu)\phi|^2 + m^2(\phi^*\phi) + \lambda(\phi^*\phi)^2 \right) \quad , \qquad (1)$$

where e is the gauge coupling, m the mass of the complex scalar ϕ and λ the Higgs coupling constant.

In the conventional notation the **lattice action** is given by (the lattice constant is set to $a = 1$)

$$S = S_G[U] + S_H[U, \phi] \qquad (2)$$

$$S_G = -\beta \sum_{x,\nu<\rho} \Re(U_{\nu\rho}(x)), \quad \beta = \frac{1}{2e^2}$$

$$S_H = \sum_x \left[-\frac{1}{2} \sum_{\mu=1}^{4} (\phi(x)^* U_\mu(x) \phi(x+\hat{\mu}) + \phi(x)^* U_\mu(x-\hat{\mu})^* \phi(x-\hat{\mu})) \right.$$
$$\left. + \kappa\phi(x)^*\phi(x) + \lambda \left(\phi(x)^*\phi(x)\right)^2 \right], \quad \kappa = \frac{m^2+8}{2} \quad .$$

Acknowledgments

This work was supported by the Austrian Science Fund, FWF, through the Doctoral Program on *Hadrons in Vacuum, Nuclei, and Stars* (FWF DK W1203-N16).

References