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Critical Analyses of Order Parameter and Phase Transitions at High Density in Gross-Neveu Model

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Abstract: By critical analyses of the order parameter of symmetry breaking, we have researched the phase transitions at high density in D=2 and D=3 Gross-Neveu (GN) model and shown that the gap equation obeyed by the dynamical fermion mass has the same effectivenesss as the effective potentials for such analyses of all the second order and some special first order phase transitions. In the meantime we also further ironed out a theoretical divergence and proven that in D=3 GN model a first order phase transition does occur in the case of zero temperature and finite chemical potential.

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Key words: Gross-Neveu model, critical analyses of order parameter, gap equation, effective potential, symmetry restoration at high density, first order and second order phase transition

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