

Unstable Hertel-Thirring Models

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The thermodynamic limit in conventional statistical mechanics does not exist for models with long-range interactions, when the ground state energy depends superlinearly on particle number. Recently, generalized ensembles were introduced for systems of this kind [1]. Using these generalized ensembles, exact thermodynamic potentials are computed analytically for unstable Hertel-Thirring models. A line of first order phase transitions separates a condensed phase from an expanded phase in the temperature-volume fraction plane. The first order transitions can become strong in the region of small temperature and small volume fraction. The line of first order transitions ends in a higher order critical point which has thermal order $4/3$ in the generalized classification of Ehrenfest.

[1] R. Hilfer, Phys.Rev.E, 105, 024142 (2022)