Maslov, V. P.
Phase transition for classical bosons, fermions, and ordinary classical particles. (English. Russian original) Zbl 0940.82026
Math. Notes 63, No. 5, 695-699 (1998); translation from Mat. Zametki 63, No. 5, 792-795 (1998).

The self-consistent field equation for classical bosons, fermions, particles obeying other parastatistics, as well as for classical particles under zero external field is studied. More realistic pair potentials attaining their minimum at some non-zero distance between two particles are considered. Different types of phase transitions derived from the equation and their physical meaning are discussed briefly.

'Metastable' equilibrium states can take place in the systems with a large number of particles. This corresponds to a temperature equilibrium with some series of eigenvalues [see *V. P. Maslov*, Quasi-particles associated with isoenergetic manifolds corresponding to classical self-consistent fields. I-XII, Russ. J. Math. 2-5 (1994-1997)] for which the probabilities of transitions to the other energy levels are small.

Semiclassical corrections for the case of low temperature are also studied and dispersion relations for quasi-particles are derived. The one-dimensional result provides a reasonable numerical estimate of the critical velocity for helium and differs from the analogous Bogolyubov's formula [*N. N. Bogolyubov*, Izv. Akad. Nauk SSSR, Ser. Fiz. 11, No. 1, 77-90 (1947)].

Reviewer: P.Dyshlovenko (Ul'yanovsk)

MSC:

82B26	Phase transitions (general) in equilibrium statistical mechanics
82D50	Statistical mechanical studies of superfluids
81V25	Other elementary particle theory in quantum theory
81Q20	Semiclassical techniques, including WKB and Maslov methods applied to problems in quantum theory

Cited in **2** Documents

Keywords:

phase transition; classical particle; boson; fermion; Hartree equation; Vlasov-Poisson-Boltzmann equation; Bogolyubov's formula

Full Text: DOI

References:

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[2]   V. P. Maslov, "Quasi-particles associated with isoenergetic manifolds corresponding to classical self-consistent fields. I–XI,"Russian J. Math. (1995–1997). · Zbl 0909.58040

[3]   V. P. Maslov,Operator Methods [in Russian], Nauka, Moscow (1973).

[4]   N. N. Bogolyubov,Izv. Akad. Nauk SSSR. Ser. Fiz.,11, No. 1, 67–92 (1947).

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