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Preprint

Hamiltonian formalism for Bose excitations in a plasma with a non-Abelian interaction

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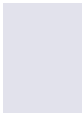
Abstract

We have developed the Hamiltonian theory for collective longitudinally polarized colorless excitations (plasmons) in a high-temperature gluon plasma using the general formalism for constructing the wave theory in nonlinear media with dispersion, which was developed by V.E. Zakharov. In this approach, we have explicitly obtained a special canonical transformation that makes it possible to simplify the Hamiltonian of interaction of soft gluon excitations and, hence, to derive a new effective Hamiltonian. The approach developed here is used for constructing a Boltzmann-type kinetic equation describing elastic scattering of collective longitudinally polarized excitations in a gluon plasma as well as the effect of the so-called nonlinear Landau damping. We have performed detailed comparison of the effective amplitude of the plasmon-plasmon interaction, which is determined using the classical Hamilton theory, with the corresponding matrix element calculated in the framework of high-temperature quantum chromodynamics; this has enabled us to determine applicability limits for the purely classical approach described in this study.

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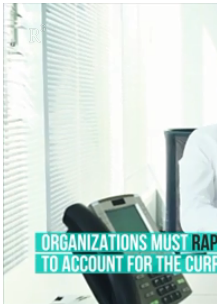
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Hamiltonian formalism for Fermi excitations in a plasma with a non-Abelian interaction

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The Hamiltonian theory for the collective longitudinally polarized colorless gluon excitations (plasmons) and for collective quark-antiquark excitations with abnormal relation between chirality and helicity (plasminos) in a high-temperature quark-gluon plasma (QGP) is developed. For this purpose, Zakharov's formalism for constructing the wave theory in nonlinear media with dispersion is used. A ... [\[Show full abstract\]](#)

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