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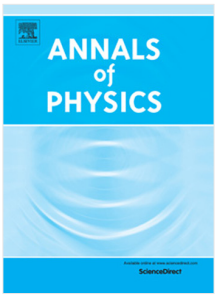

Electric fields at finite temperature

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Electric fields at finite temperature

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Abstract

Partial differential equations for the electric potential at finite temperature, taking into account the thermal Euler-Heisenberg contribution to the electromagnetic Lagrangian are derived. This complete temperature dependence introduces quantum corrections to several well known equations such as the Thomas-Fermi and the Poisson-Boltzmann equation. Our unified approach allows at the same time to derive other similar equations which take into account the effect of the surrounding heat bath on electric fields. We vary our approach by considering a neutral plasma as well as the screening caused by electrons only. The effects of changing the statistics from Fermi-Dirac to the Tsallis statistics and including the presence of a magnetic field are also investigated. Some useful applications of the above formalism are presented.

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