

Thermodynamics of hadrons using the Gaussian functional method in the linear sigma model

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We investigate thermodynamics of hadrons using the Gaussian functional method (GFM) at finite temperature. Since the interaction among mesons is very large, we take into account fluctuations of mesons around their mean field values using GFM. We obtain the ground state energy by solving the Schroedinger equation. The meson masses are obtained using the energy minimization condition. The resulting mass of Nambu-Goldstone (NG) boson is not zero even in the spontaneous chiral symmetry broken phase due to the non-perturbative effect. We consider then the bound state of mesons using the Bethe-Salpeter equation and show the NG theorem is recovered. We investigate further the behavior of the meson masses and the mean field value as functions of temperature for the cases of chiral limit and explicit chiral symmetry breaking.

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