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Thermal and baryon density modifications to the σ-boson propagator

Content

In the context of the description of how the vortical motion, produced in peripheral heavy-ion collisions, is transferred to the spin of hadrons, we compute the σ-meson propagator at finite temperature and baryon density. This propagator encodes the properties of a medium consisting mainly of nucleons and can be used to model the main interactions between hadrons in the corona region of the reaction. We compute the one-loop σ self-energy in an approximation that accounts for the large nucleon mass. From the real part of the self-energy, we find the dispersion relation and show that the σ-mass receives a non-negligible thermal and baryon chemical dependent contribution. From the imaginary part, we also compute the spectral density, which we show to contain a piece coming from the branch cut associated with Landau damping. We also present approximations for the dispersion relation and the residue at the pole in the small- and large-momentum regimes and complement the calculation, providing the sum rules satisfied by the propagator. This study aims to determine one of the elements needed to compute how the vortical motion in the corona region of the reaction is transferred to the spin of Λ hyperons that can interact with nucleons by σ-meson exchange

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